

UNITED STATES OF AMERICA:  
WAR DEPARTMENT.

# MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

JULY, 1889.

## CONTENTS.

	Page.		Page.
INTRODUCTION.....	169	ATMOSPHERIC ELECTRICITY .....	187
ATMOSPHERIC PRESSURE.....	169	Auroras ; Thunder-storms.	
General distribution ; Comparison of barometric means with those of previous month ; Departures from normal ; Monthly barometric ranges ; Areas of high pressure ; Areas of low pressure.		MISCELLANEOUS PHENOMENA .....	188
NORTH ATLANTIC STORMS.....	173	Forest fires ; Halos ; Meteors ; Mirage ; Sand Storms ; Drought ; Sun spots.	
North Atlantic storms for July, 1889 ; Ocean ice ; Fog.		VERIFICATIONS .....	189
TEMPERATURE OF THE AIR .....	175	Forecasts ; Forecasts for forty-eight hours ; Cautionary signals ; Local verifications.	
General remarks ; Deviations from normal temperatures ; Maximum and minimum temperatures ; Monthly and daily ranges ; Frost ; Temperature of water.		STATE WEATHER SERVICES.....	190
PRECIPITATION .....	177	Extracts from reports of the several services.	
General distribution ; Deviations from average precipitation ; Excessive precipitation ; Maximum rainfalls in one hour, or less ; Hail ; Snow.		METEOROLOGICAL TABLES.....	193
WINDS .....	182	Data from stations of voluntary observers ; Retarded reports for June ; Precipitation at Fort Benton, Mont., Camp Date Creek, Ariz., Pantano, Ariz., and Fort Defiance, Ariz. ; Normal temperature and departures at New Ulm, Tex. ; Data from stations of the Signal Service.	
Prevailing directions ; High velocities ; Local storms.		CHARTS—I. Tracks of areas of low pressure ; II. Isobars, isotherms, and winds ; III. Precipitation.	
LAND NAVIGATION .....	186		
Floods ; Stage of water in rivers and harbors.			

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PUBLISHED BY AUTHORITY OF THE SECRETARY OF WAR.

WASHINGTON CITY:  
SIGNAL OFFICE.  
1889.



*List of merchant marine steam and sailing vessels from which International Meteorological reports were received at the office of the Chief Signal Officer,  
U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of July, 1889.*

Name of vessel.	Captain.	Name of vessel.	Captain.	Name of vessel.	Captain.
Am. s. s. Adirondack.....	J. Sansom.	Br. Grecian.....	C. E. Le Gallais.	Br. Servia.....	H. Walker.
Br. Adriatic.....	J. G. Cameron.	Greece.....	A. J. Jeffrey.	Siberian.....	R. P. Moore.
Alma.....	J. W. Morris.	Span. Guido.....	E. Lachiondo.	Nor. s. s. Sif.....	H. Bentzon.
Alameda.....	H. G. Morse.	Ger. Hammonia.....	H. Vogelgesang.	Ger. Slavonia.....	H. Schmidt.
Am. Alamo.....	S. Risk.	Br. Haytian.....	J. Coward.	Br. Spain.....	W. A. Griffiths.
Br. Alaska.....	G. S. Murray.	Haytian Republic.....	G. W. Brown.	State of Georgia.....	G. Moodie.
Am. Algiers.....	F. W. Mason.	Br. Hecla.....	A. G. Thomsen.	State of Indiana.....	A. Ritchie.
Br. Alene.....	E. J. Seiders.	Br. Helvetia.....	G. Cochran.	State of Nevada.....	J. A. Stewart.
Ger. Allemannia.....	Droescher.	Ger. Hermann.....	W. Schmolder.	State of Pennsylvania.....	A. J. A. Mann.
Am. Alps.....	Jno. Latimer.	Br. Hibernian.....	John Brown.	State of Texas.....	G. Williams.
Br. Alvena.....	F. McKay.	Hindoo.....	Jas. Douglas.	Stockholm City.....	W. Thompson.
Alvo.....	David Williams.	Holland.....	Thos. Foote.	Strassburg.....	F. Rodenberg.
Dutch. Amsterdam.....	G. Stenger.	Ger. Holsatia.....	G. Busch.	Br. Strathairly.....	Boughton.
Br. Anchoria.....	A. Campbell.	Howick.....	J. Ellis.	Ger. Suevia.....	C. Ludwig.
Angers.....	James Pinkham.	Ger. Hungarian.....	Leithausen.	Belg. Switzerland.....	J. Ueberweg.
Arabic.....	A. M. Smith.	Span. Hugo.....	A. de Mugica.	Ger. Taormina.....	G. W. Koch.
Ardanagh.....	H. Cameron.	Ger. Hungary.....	Droescher.	The Queen.....	T. P. Heeley.
Ardanigh.....	W. Anderson.	Am. Indiana.....	W. J. Boggs.	Thingvalla.....	S. T. H. Lauf.
Arizona.....	S. Brooks.	Br. Iowa.....	E. W. Owens.	Toronto.....	J. MacAuley.
Ascania.....	P. Froehlich.	Dan. Island.....	W. Skjott.	Ger. Trave.....	W. Reinkasten.
Athos.....	H. Low.	Ger. Italia.....	G. Schmidt.	Br. Trinacria.....	G. Mitchell.
Augusta Victoria.....	A. Albers.	Br. Italia.....	Thos. Craig.	Trinidad.....	W. J. Fraser.
Aurania.....	H. McKay.	Italy.....	W. Pearce.	Ulunda.....	T. Clark.
Austerlitz.....	Jas. D. Fraiser.	Kansas.....	A. Fenton.	Vancouver.....	C. J. Lindall.
Author.....	J. G. Jones.	Nor. Kong Alp.....	J. Dahl.	Vandeyck.....	T. P. Fisher.
Australia.....	Jno. McKeague.	Fr. La Bourgogne.....	E. Franguel.	Venetian.....	E. Parry.
Br. Balder.....	L. Christie.	La Bretagne.....	M. de Jousselein.	Nor. Viking.....	S. H. Frus.
Br. Baltimore.....	J. W. Simpson.	La Champagne.....	Boyer.	Br. Viola.....	L. Murray.
Barracouta.....	R. R. Hubbard.	La Gascogne.....	Santelli.	Br. Virginian.....	W. C. Fry.
Barrowmore.....	W. H. Moore.	Lahn.....	H. Hellmers.	Belg. Wesland.....	H. Buschmann.
Br. Bavarian.....	M. Fitt.	Lake Huron.....	Richard Owens.	Br. Waldensian.....	A. Whyte.
Belg. Belgium.....	R. Weyer.	Lake Ontario.....	H. Campbell.	Ger. Werra.....	R. Hussius.
Ger. Berlia.....	A. Von Collin.	Lake Nepigon.....	C. F. Herriman.	Belg. Westernland.....	J. C. Jamison.
Span. Beritta.....	L. Santaulari.	Lake Superior.....	Wm. Stewart.	Ger. Wieland.....	H. Barends.
Ger. Bohemia.....	G. Thelle.	Lake Winnipeg.....	P. D. Murray.	Br. Wisconsin.....	J. P. Worrall.
Br. Borderer.....	F. Manley.	Lampassas.....	A. B. Connor.	Wyoming.....	C. L. Rigby.
Fr. Britannia.....	Coste.	La Normandie.....	G. Collier.	Zaandam.....	W. Ponsen.
Br. Britannic.....	H. Davison.	Lero.....	J. Chisholm.		
British Empire.....	B. Wills.	Llandaff City.....	T. H. Gore.	United States Naval.	
British King.....	John Kelly.	Lord Clive.....	P. Urquhart.	U. S. C. s. A. D. Bache.....	J. F. Moser.
British Prince.....	S. Nowell.	Lord Gough.....	E. M. Hughes.	U. S. s. Alert.....	James G. Green.
British Princess.....	E. H. Froeth.	Lord O'Neill.....	A. Ferris.	U. S. s. Alliance.....	G. W. Pigman.
Brooklyn City.....	W. Fitt.	Louisiana.....	E. V. Gager.	U. S. s. Atlanta.....	J. A. Howell.
Br. Buenos Ayres.....	James Scott.	Lydian Monarch.....	T. C. Huggett.	U. S. C. s. G. S. Blake.....	J. E. Pillsbury.
Br. Buffalo.....	J. H. Malet.	Maine.....	R. Griffiths.	U. S. s. Constellation.....	P. F. Harrington.
Bulgarian.....	R. Leask.	Manitoba.....	J. M. Johnstone.	U. S. s. Despatch.....	W. S. Cowles.
Fr. Burgundia.....	F. Dulac.	Manitoba.....	R. G. Warwick.	U. S. s. Dolphin.....	G. F. F. Wilde.
Ger. California.....	H. Bauer.	Mareca.....	L. O. Moen.	U. S. s. Enterprise.....	B. H. McCalla.
Br. California.....	R. T. Garvie.	Marenhense.....	Thos. Pole.	U. S. s. Lancaster.....	T. F. Kane.
California.....	J. W. Pickthall.	Marsala.....	N. Maass.	U. S. s. Minnesota.....	G. C. Wiltse.
Camellia.....	E. Penney.	Martello.....	Wm. Abbott.	U. S. s. New Hampshire.....	J. F. Higginson.
Caribbean.....	H. Daniel.	Maryland.....	A. H. Luckhurst.	U. S. s. Ranger.....	F. A. Cook.
Carroll.....	G. H. Brown.	Mentmore.....	R. Waite.		
Catalonia.....	J. J. Atkin.	Michigan.....	S. Walters.	Sailing vessels.	
Coarense.....	J. G. Heath.	Minneola.....	T. L. Evans.	Am. bg. Abbe Clifford.....	D. W. Storer.
Celtic.....	E. J. Smith.	Minia.....	S. Trott.	schr. Addie Jordan.....	W. H. Harriman.
Cephalonia.....	Thomas Dutton.	Minnesota.....	R. J. Blacklin.	Nor. bk. Agatha.....	C. F. S. Rohr.
Chalmette.....	Geo. W. Mason.	Montreal.....	Joseph Wall.	Ger. bk. Auguste.....	H. Schumacher.
Chateau Lafite.....	M. C. Olliver.	Moravia.....	Winkler.	Am. bkt. Albert Schults.....	J. S. Fries.
Cherokee.....	H. A. Bearse.	Mount Edgecombe.....	J. Wetherel.	Am. bk. Alice.....	W. G. Knair.
Br. Circassia.....	J. Harris.	Munchen.....	A. Jager.	Altcar.....	R. Magrath.
Circassian.....	R. Barrett.	Muriel.....	G. S. Locke.	Am. schr. Anna.....	Henry Gillette.
City of Alexandria.....	J. McIntosh.	Nederland.....	E. Bence.	Anna E. Kraus.....	T. Newcomb.
Br. City of Berlin.....	A. W. Lewis.	Neasmore.....	E. Elliott.	Ger. bk. Anna Thorman.....	R. Witt.
Am. City of Chester.....	E. Barff.	Nesjorian.....	J. France.	Bonita.....	D. Koch.
Br. City of Chicago.....	A. Redford.	Neustria.....	P. Verriera.	Nor. bk. Carsten Boe.....	E. Mathiesen.
Am. City of Para.....	J. L. Lockwood.	Nevada.....	J. A. R. Cushing.	Am. Chas. F. Ward.....	J. L. Coombs.
Br. City of Paris.....	Fred. Watkins.	Newnham.....	Stabell.	Am. schr. Clara Goodwin.....	Frank Wyman.
City of Rome.....	H. Young.	Newport.....	C. C. Lima.	Elbridge Souther.....	J. T. Fales.
Br. Colina.....	R. J. Jennings.	New Orleans.....	T. P. C. Halsey.	Florence Randall.....	J. L. Randall.
Colon.....	F. Henderson.	Noordland.....	H. E. Nickels.	Aust. bk. Francesca T.....	M. P. Martinolich.
Am. Colorado.....	F. E. Jenkins.	Norseman.....	R. Williams.	Am. schr. Gertrude.....	R. H. Cox.
Br. Corea.....	C. J. Mensies.	Northgate.....	W. Ramsdale.	Ger. bk. Goschen.....	D. Knippenberg.
Croma.....	W. N. Lord.	Nova Scotia.....	R. H. Hughes.	G. N. Wilcox.....	W. Rasche.
Crystal.....	R. B. Stannard.	Ocean Prince.....	W. J. Milburn.	Am. bg. H. B. Hussey.....	G. W. Hodgdon.
Cydonia.....	E. S. Winters.	Ohio.....	R. W. Sargent.	Br. bgt. Hattie Louise.....	W. H. Barnard.
Daventry.....	D. D. Galbraith.	Ontario.....	W. P. Couch.	Nor. bk. Hanna.....	S. F. Muns.
Damara.....	Geo. Dixon.	Oranmore.....	B. Jones.	Am. bg. Havilah.....	W. S. Richardson.
Denmark.....	R. S. Rigby.	Oregon.....	H. C. Williams.	Am. sp. Henry Villard.....	F. B. Perkins.
Derwent.....	J. Pope.	Orinoco.....	J. S. Garvin.	schr. Henry A. Faber.....	H. E. Greliek.
Devonia.....	Jno. Craig.	Othello.....	H. Munday.	Port. bk. Industria.....	A. Duarto.
Ger. Dithmarschen.....	Y. G. Geiken.	Osmali.....	C. O'Hagen.	Br. bk. Iodine.....	Adam Smith.
Br. Dorian.....	J. McFarlane.	Palestine.....	W. Whiteway.	Ivigitt.....	W. Andersen.
Durham City.....	J. A. Jacobsen.	Parisian.....	J. Ritchie.	Am. schr. John R. Bergen.....	W. H. Squires.
Earnmoor.....	R. Grey.	Pavonia.....	A. McKay.	bk. John R. Stanhope.....	J. B. Norton.
Earnwell.....	W. H. Carter.	P. Caland.....	G. Lutz.	pilot Joseph F. Loubat.....	J. McCarthy.
Edam.....	W. Bakker.	Pennland.....	C. H. Grant.	Br. sp. Joseph H. Seammell.....	J. H. Crossley.
Br. Edith Godden.....	J. H. Bennett.	Peruvian.....	J. M. Wallace.	Am. schr. Kate Church.....	J. H. Weeks.
Egypt.....	J. Sumner.	Petriania.....	S. W. Ryder.	bk. Kennard.....	J. A. Bettencourt.
Egyptian Monarch.....	T. M. Irvin.	Polynesia.....	G. Franck.	Br. sp. Langdale.....	J. McAllister.
Ger. Elder.....	H. Baur.	Ponca.....	W. Bowen.	Latimer.....	J. G. Robertson.
Elbe.....	R. Sander.	Pontiac.....	R. Blythe.	Am. bk. Levanter.....	G. F. Gerry.
El Monte.....	R. B. Quick.	Portia.....	F. Ash.	sp. Light vessel No. 45.....	Andrew Jackson.
Br. Ema.....	T. Jungst.	Powhatan.....	John Edwards.	Louis Walsh.....	T. C. Pendleton.
Br. England.....	A. F. Heeley.	Prins Fred. Hendrich.....	H. N. Prins.	L. S. Portia.....	F. Ash.
Span. Enrique.....	R. de Abernariuri.	Prussian.....	J. Ambury.	Aust. bk. Margarita.....	A. Boschi.
Br. Erin.....	W. Tyson.	Rhaetia.....	E. Kopf.	Mattea.....	G. Viculich.
Ethiopia.....	John Wilson.	Rhein.....	F. Warnkes.	Am. schr. Mand H. Dudley.....	A. L. Cummings.
Etruria.....	W. H. P. Hains.	Rhyndland.....	A. J. Griffin.	May O'Neill.....	J. E. Creighton.
Euphrates.....	James Edwards.	Richmond Hill.....	H. J. Perry.	Br. bk. Minden.....	R. MacDonald.
Exeter City.....	T. L. Weiss.	Ripon City.....	J. Brochie.	Am. bkt. Monsita.....	F. M. Wallace.
Am. Excelsior.....	H. L. Higgins.	Robinia.....	T. H. Smith.	bk. Neptune.....	J. F. Hill.
Br. Federation.....	R. Pinkham.	Rochampton.....	R. Sanderson.	schr. Otello.....	M. J. Bond.
France.....	A. D. Hadley.	Roman.....	E. Maddox.	Phebe.....	M. Medero.
Ger. Fulda.....	R. Ringk.	Rotterdam.....	H. C. v. d. Zee.	Nor. bk. Prince Eugene.....	C. Nygaard.
Span. Gaditano.....	F. Goicoechea.	Rugia.....	R. Karlowa.	Am. bg. Robert Mowe.....	W. Peterson.
Br. Gaelic.....	W. G. Pearne.	Saale.....	B. Blanke.	bk. Sarah.....	L. R. Hale.
Galileo.....	W. Magee.	Saint Asaph.....	C. H. Hoscock.	Ger. Soli-Deo-Gloria.....	F. Abendorth.
Ger. Gellert.....	C. Kaempff.	Saint Ronans.....	H. Campbell.	Am. sp. St. Johns.....	O. H. Fales.
Br. Germanic.....	H. Davison.	Santiago.....	J. B. Allen.	bk. Teresa Accams.....	G. Boetto.
Glenfield.....	J. Newdick.	Sardinian.....	W. Richardson.	Am. bg. T. Towner.....	C. E. Dayton.
Ger. Gluckauf.....	V. Szymanski.	Sarnia.....	J. Gibson.	schr. Thomas P. Ball.....	H. B. Ryder.
Br. Gothenburg City.....	J. Harrison.	Scandinavian.....	J. Park.	sp. Tillie E. Starbuck.....	E. Curtis.
Ger. Gothia.....	A. Kuhn.	Seneca.....	F. Stevens.	yacht Vicking.....	J. M. Mason.
Br. Governor.....	J. Valiant.	Span. Serra.....	F. de Lusarraga.	schr. Wyr G. Sargent.....	R. B. Sargent.



# UNITED STATES SIGNAL SERVICE

## MONTHLY WEATHER REVIEW.

VOL. XVII.

WASHINGTON CITY, JULY, 1889.

No. 7.

### INTRODUCTION.

This REVIEW treats generally the meteorological conditions of the United States and Canada for July, 1889, and is based upon reports of regular and voluntary observers of both countries.

On chart i the paths of the centres of fourteen areas of low pressure are shown; the average number traced for July during the last nineteen years being 9.8. This chart also exhibits the paths of the centres of seven depressions traced over the north Atlantic Ocean; the limits of fog-belts west of the fortieth meridian, and the distribution of icebergs and field ice during the month. The areas of high and low pressure and north Atlantic storms are discussed under their respective headings.

Chart ii exhibits the distribution of mean atmospheric pressure and temperature for the month. The mean temperature generally averaged below the normal east of the Rocky Mountains, while in the Rocky Mountain and plateau regions and on the middle Pacific coast the month was slightly warmer than the average July. At several stations in the southwestern part of the country the absolute maximum temperature was as high, or higher, than has been recorded for July during the periods of observation, while at stations in the Lake region, the upper Mississippi and upper Missouri valleys, and at Portland, Oregon, the minimum temperature was as low, or lower, than previously reported for July.

Chart iii shows the distribution of precipitation for July, 1889. The precipitation was largely in excess of the normal in areas east of the Rocky Mountains. Over the Rocky Moun-

tain and plateau regions and on the Pacific coast it was deficient, except at stations in the southern plateau region, southwestern Oregon, and northern Montana. A remarkable feature of the month was the irregular distribution of rainfall over the eastern half of the country, where large excesses and marked deficiencies occurred in limited areas. The rainfall of the month is discussed under the heading "Precipitation."

Under the headings "Local storms," "Floods," and "Drought" will be found descriptions of the more important storms, disastrous floods, and damaging drought of the month.

In the preparation of this REVIEW data from 2,218 stations have been used, classified as follows: 176 Signal Service stations; 120 monthly registers from United States Army post surgeons; 1,396 monthly registers from state weather service and voluntary observers; 23 Canadian stations; 160 stations through the Central Pacific Railway Company; 343 marine reports through the co-operation of the Hydrographic Office, United States Navy; marine reports through the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Dakota, Illinois, Indiana, Iowa, the Iowa Weather Crop Bulletin Service, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New England, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Tennessee, and Texas, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

### ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for July, 1889, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on chart ii by isobars. The difference between the mean pressure for July, obtained from observations taken twice daily at the hours named, and that determined from hourly observations varies at the stations named below as follows: At Washington, D. C., Philadelphia, Pa., New York, N. Y., Boston, Mass., and Saint Louis, Mo., the mean of the 8 a. m. and 8 p. m. observations was higher by .003, .007, .006, .007, and .007, respectively, while at Chicago, Ill., the mean of the observations taken at these hours was .001 lower than the true mean pressure.

The mean pressure for July, 1889, was highest over southeastern Florida, where it rose to 30.10, at Jupiter, and was above 30.05 along the immediate south Atlantic coast and over eastern Florida. From eastern Texas eastward to the Atlantic coast and northeastward to the south New England coast, and along the immediate Pacific coast north of the fortieth parallel, the mean values were above 30.00. The mean pressure was lowest within an area extending from the lower Colorado valley northward over southeastern California and southern Nevada, where the values were below 29.80, and fell to 29.75 at Yuma, Ariz., and Keeler, Cal. On the south Pacific coast, over a greater portion of the middle and southern

plateau regions and the southeastern slope of the Rocky Mountains, in the middle Missouri valley, and from the lower Saint Lawrence valley westward to the one hundred and twelfth meridian the mean pressure was below 29.90.

Compared with the pressure chart for June, 1889, a decrease in pressure is shown, except over the southern half of Florida, in the more southern districts west of the Mississippi River, along the California coast north of the thirty-fifth parallel, and in the upper Missouri valley and the British Possessions to the northward. The greatest increase in pressure occurred in and north of northern Montana, where it was more than .05, and the greatest decrease, .05, or more, in eastern Nova Scotia, and the Atlantic coast states between the thirty-fourth and fortieth parallels. Elsewhere the changes were less than .05. In June the mean pressure was highest, 30.11, on the North Carolina coast, while for the current month the highest value, 30.10, was reported on the southeastern coast of Florida. The changes in pressure within the area of low mean pressure over the southern plateau region have been unimportant.

Compared with the normal pressure for July, the mean pressure was above the normal in the Canadian Maritime Provinces, New England, the lower lake region, along the immediate middle and south Atlantic coasts, over eastern Florida, a portion of the middle and southern plateau regions, and at



stations in north-central Montana and southwestern Wisconsin; elsewhere the mean pressure was below the normal. The greatest departures above the normal were reported in the Canadian Maritime Provinces and the Saint Lawrence Valley, where they exceeded .05, and the most marked departures below the normal were noted at stations on the north Pacific coast and in southern California, where they were more than .05; elsewhere the departures from the normal pressure were small.

#### BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are given in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In July, 1889, the ranges were greatest in northeastern New England and the more northern parts of the upper lake region, where they exceeded .70, whence they decreased southward to the Gulf of Mexico, southwestward to the Rio Grande and Gila valleys, and westward to the Pacific. Along the Atlantic coast the extreme ranges varied from .16, at Key West, Fla., to .72 at Eastport, Me.; between the eighty-second and ninety-second meridians, .25 at New Orleans, La., to .74 at Marquette, Mich.; between the Mississippi River and the Rocky Mountains, .27 at Galveston, Tex., to .63 at Fort Sully, Dak.; in the plateau and Rocky Mountain regions, .24 at Whipple Barracks (Prescott), Ariz., to .69 at Walla Walla, Wash.; on the Pacific coast, .26 at San Diego, Cal., to .57 at Olympia, Wash.

#### AREAS OF HIGH PRESSURE.

Nine such areas affected the weather of the United States during the month of July. They may be divided into three groups, according to geographical distribution. Those of the first group (ii, iii, and viii) developed on the north Pacific coast; the second group (v and vii) first appeared in the Saskatchewan Valley, and the third group (i, iv, vi, and ix) was confined to the Atlantic coast states. Comparing the values of the different groups for the current month (Table No. I) we obtain the following results:

The average duration of the first group was 7.5 days, the average maximum pressure 30.30 inches, and the average velocity of progression 20.4 miles per hour. The second group averaged 7.5 days, 30.23 inches, and 16.5 miles per hour. The third group averaged 6.57 days, 30.267 inches, and 67 miles per hour.

The last group presents rather unsatisfactory data, owing to the peculiar situation and movement of the areas. From a study of the distribution of mean atmospheric pressure for the month, and of the movement of both highs and lows, it appears quite probable that the areas of the third group were simply outcroppings of a very extensive and persistent anti-cyclone lying off the Atlantic coast, with its centre slowly oscillating north and south in about the meridian of the Bermudas.

Certain important effects have resulted from this disposition of pressure, which are briefly referred to as follows:

First. The interruption of the progressive easterly movement of the areas in the 1st and 2d groups, which condition was shown by the irregular paths, in most instances the tracks curving upon themselves several times, with the evidence that the areas were slowly merging into a larger anti-cyclone off the coast. This incurving of the paths was confined, as might be expected, to the region of country along the Atlantic coast, and the progressive velocity east of the eighty-second meridian, as compared with that east of the ninety-seventh, showed an average diminution of 7.7 miles per hour.

Second. The interruption of the progressive easterly movement of the areas of low pressure, which may be expressed by saying that, on the average, the velocity east of the seventy-second meridian was reduced 3.3 miles per hour, as compared with the velocity east of the ninety-seventh meridian.

Third. The northeasterly trend of the low pressure areas east

of the seventy-seventh meridian, the average latitude of departure being 45°. Compared with the average values for the past sixteen years the number of high areas for July, 1889, shows an increase of 3.1, and also a greater number than any other year except 1885, when they reached the present number, nine. The maximum pressure shows an increase of .08 inch.

The accompanying tables (i and ii) have been prepared to present in graphic form some of the notable features and prevailing characteristics of the high pressure areas for July, 1889.

From a study of the development and movement of anti-cyclonic areas it is found that to their influence may be traced some of the highest wind velocities of the month and the largest rainfalls. These phenomena are located in the southeast quadrant of the high, where the cold westerly winds first come in contact with the warm, moist, southerly winds of the disappearing low, in the southeast quadrant of which the more violent local storms (tornadoes, hail-storms, and thunderstorms) developed.

Considering the records for the past seventeen years the average monthly number of high areas is 5.9, or 3.1 below the number for the current month, and the average maximum pressure is 30.19, or .08 inch below the current month.

The following is an interesting comparison of the average monthly values of the three groups of high areas:

Group number 1: Maximum rise in pressure in twelve hours, .30 inch; maximum fall in temperature in twelve hours, 21°; maximum wind velocity, in miles per hour, 49; lowest temperature, 37°; absolute fall in temperature in twenty-four hours, 26°; minimum dew-point, 7°; maximum fall in dew-point in twenty-four hours, 22°; maximum rainfall in twenty-four hours, 4.23 inches.

Group number 2: Maximum rise in pressure in twelve hours, .28 inch; maximum fall in temperature in twelve hours, 17°; maximum wind velocity, in miles per hour, 42; lowest temperature, 29°; absolute fall in temperature in twenty-four hours, 22°; minimum dew-point, 2°; maximum fall in dew-point in twenty-four hours, 20°; maximum rainfall in twenty-four hours, 4.23 inches.

Group number 3: Maximum rise in pressure in twelve hours, .21 inch; maximum fall in temperature in twelve hours, 12°; maximum wind velocity, in miles per hour, 31.5; lowest temperature, 52°; absolute fall in temperature in twenty-four hours, 12°; minimum dew-point, 51°; maximum fall in dew-point in twenty-four hours, 12; maximum rainfall in twenty-four hours, 3.81 inches.

A careful examination of the above comparisons reveals the fact that the areas in group number 1 were accompanied by the most decided changes in pressure, temperature, wind velocity, and moisture, and exhibited the greatest energy of any of the three groups. The average velocity of progression also much exceeded this value for the other two groups. The areas in group number 2 were accompanied by the lowest temperatures and dew-points, and by greater precipitation than attended the areas of group number 3. The latter, however, were marked by the maximum pressures of the month, due undoubtedly to the continued high pressure off the Atlantic coast.

Areas number v, vii, and viii were the most important anti-cyclones which traversed the country during the month. The two former came from the Northwest Territory and the latter from the north Pacific coast. Each area was attended with excessive precipitation, number viii being the most prominent in this respect, the effect of its decrease in temperature being experienced along the entire Gulf and Atlantic coasts.

The influence of number v on precipitation was most decided throughout the upper Mississippi valley, and of number vii in the Missouri valley.

**Recapitulation.**—The most prominent features of the month concerning high pressure areas are as follows:

1. A persistent high area off the Atlantic coast, which left a decided effect upon the mean reduced pressure for the month.
2. A marked interruption in the easterly movement of high areas east of the eighty-second meridian.



3. The influence of high areas on precipitation, giving rise to the heaviest rainfalls of the month.

4. The twelve-hour change in pressure was the maximum one for each area during the month, and occurred between 8 p. m. and 8 a. m. in all cases, except for area number v, when it took place between 8 a. m. and 8 p. m.

5. The twelve-hour change in temperature was the maximum one for each area during the month, and occurred between 8 a. m. and 8 p. m. in all cases, except for area number ii, when it took place between 8 p. m. and 8 a. m.

The following tables exhibit in a concise manner some of the more prominent characteristics of the high areas:

TABLE No. I.

No.	First observed.			Last observed.			Duration.	Velocity per h'r.		Highest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.					Date.	Station.	Reading.
I.....	1	43	67	43	59	4.0	11.0	1		1	Halifax, N.S.....	30.44
II.....	1	44	125	35	82	9.0	23.8	2		2	Spokane Falls, Wash..	30.36
III.....	4	44	127	43	81	8.0	19.1	9		9	Port Angeles, Wash...	30.28
IV.....	8	50	72	49	67	2.0	12.5	10		10	Fort Custer, Mont.....	30.14
V.....	10	52	115	35	72	8.0	15.5	16		16	Father Point, Quebec..	30.20
VI*.....						17.0†		13-14		13-14	Anticosti Island.....	30.20
VII.....	20	50	114	47	98	7.0	17.6	27		27	Chicago, Ill.....	30.20
VIII.....	26	47	125	42	95	5.5	19.7	30		30	Titusville, Fla.....	30.26
IX†.....						3.0†		31		31	Jupiter, Fla.....	30.25
Mean.....		47	95	42	72	7.0†	17.0				Sydney, C. B. I.....	30.25
											Dodge City, Kans.....	30.25
											Wood's Holl, Mass.....	30.25
												30.27

\*Stationary over Florida and the east Gulf. †Centre of anti-cyclone too far off the Atlantic coast to afford reliable data.

TABLE No. II.

No.	Maximum rise in pressure for twelve hours.			Maximum abnormal fall in temperature for twelve hours.			Maximum wind velocity.		
	Amount.	Station.	Date.	Amount.	Station.	Date.	Miles per hour.	Direction.	Date.
1	.28	Sydney, N. S.....	1	14	Halifax, N. S.....	1	28	w.	2
2	.44	Denver, Colo.....	2	25	Denver, Colo.....	2	44	nw.	1
3	.26	Fort Sully, Dak.....	7	23	Cheyenne, Wyo.....	9	26	nw.	9
4	.13	Quebec, Quebec.....	9	16	Eastport, Me.....	9	26	ne.	10
5	.28	Harrisburg, Pa.....	15	16	Valentine, Nebr.....	13	45	n.	14
6	.18	Shreveport, La.....	15	10	Jacksonville, Fla.....	15	36	w.	13
7	.28	Bismarck, Dak.....	21	19	Montgomery, Ala.....	23	38	nw.	21
8	.30	do.....	29	15	Dodge City, Kans.....	26	46	ne.	30
9	.24	Sydney, N. S.....	29	10	Q'Appelle, N. W. T.....	30	36	sw.	30
10	.26	do.....		16	New York City.....	30	40	s.	31

## Remarks concerning Table No. II.

I.—This high was probably the western edge of a very extended area central south of Newfoundland.

II.—This area appeared off the Oregon coast on the 1st, reached the New Jersey coast by the 6th, thence curved to the southwest and remained nearly stationary in North Carolina from the 7th to 10th. This area is a continuation of high area number vi in June REVIEW.

III.—This area appeared off the North Pacific coast on the 4th and moved slowly eastward with diminishing energy, disappearing over the upper lakes on the 12th under the influence of low areas numbers ii and iv.

IV.—This high appears to have been the southern edge of an area central off the southeastern coast of Hudson Bay.

V.—This area appeared near British Columbia on the 10th, reached North Carolina on the 16th, where it remained nearly stationary on the coast to the 19th.

VI.—This area remained nearly stationary over the eastern Gulf and Florida from the 12th to the 29th. It was probably the western edge of a large area central over the Bahamas.

VII.—This area appeared north of Montana on the 20th and

moved thence slowly eastward over the Lake region, disappearing over Nova Scotia on the 27th.

VIII.—This area appeared off the North Pacific coast on the 26th and moved rapidly westward to the Mississippi Valley, where it was central on the 31st.

IX.—This area was probably the western edge of an anti-cyclone, the centre of which oscillated between the Bermudas and Nova Scotia.

## AREAS OF LOW PRESSURE.

Fourteen such areas affected the weather of the United States during the month of July. They may be divided into three groups, according to conditions of formation and location of development. The first group includes those areas (i, iii, x, xiii, and xiv) which entered the United States from the Northwest Territory. The second group embraces those areas (ii, iv, vi, vii, xi, and xii) which developed from a permanent low over the middle plateau. The third group embraces those areas (v, viii, and ix) which developed as secondary depressions. The average values for the first group are as follows: duration, 5.4 (+0.7\*) days; velocity of entire path, 18.7 (−3.4\*) miles per hour; minimum pressure, 29.48 (−.09\*) inches; velocity east of the seventy-second meridian, 14.7 (−7.2\*) miles, or a diminution of 3.8 miles as compared with the velocity east of the ninety-seventh meridian. For the second group: duration, 6 (+1.3\*) days; velocity of entire path, 23.5 (+1.4\*) miles per hour; minimum pressure, 29.59 (+.02\*) inches; velocity east of the seventy-second meridian, 26.7 miles per hour, or a diminution of 1.3 miles as compared with the velocity east of the ninety-seventh meridian. For the third group: duration, 2.2 (−2.5\*) days; velocity of entire path, 25.1 (+3.0\*) miles per hour; minimum pressure, 29.69 (+.12\*) inches. The entire path of area number v was east of the seventy-second meridian, and the paths of viii and ix did not extend beyond the ninety-seventh meridian. A further comparison of these groups exhibits the following results:

Group number 1 gives average values for the month as follows: maximum wind velocity in miles per hour, 42.8; maximum fall in pressure in twelve hours, .38 inch; maximum rise in temperature in twelve hours, 20°.2; highest temperature, 104°.4; absolute rise in temperature in twenty-four hours, 21°.2; maximum rainfall in twenty-four hours, 4.28 inches; maximum dew-point, 73°.6; maximum rise in dew-point in twenty-four hours, 19°.2.

Group number 2 gives the following average values for the month: maximum wind velocity in miles per hour, 46.3; maximum fall in pressure in twelve hours, .28 inch; maximum rise in temperature in twelve hours, 14°.5; highest temperature, 107°.3; absolute rise in temperature in twenty-four hours, 14°.3; maximum dew-point, 80°.3; maximum rise in dew-point in twenty-four hours, 22°.0; maximum rainfall in twenty-four hours, 3.79 inches.

Group number 3 gives the following average values: maximum wind velocity in miles per hour, 30.7; maximum fall in pressure in twelve hours, .19 inch; maximum rise in temperature in twelve hours, 10°.3; highest temperature, 95°.3; absolute rise in temperature in twenty-four hours, 11°.0; maximum dew-point, 75°.3; maximum rise in dew-point in twenty-four hours, 16°.6; maximum rainfall in twenty-four hours, 3.89 inches.

From the above comparison of monthly average values it is found that the low pressure areas in group number 1 displayed the greatest energy and were attended with the greatest precipitation and most decided changes in temperature and moisture.

Low area number xiii, of group number 1, which appeared in the Northwest Territory on the afternoon of the 23d, is credited with the heaviest rainfalls of the month, but they were really caused by the advance of high area number viii, which on the 30th and 31st was moving eastward in the central Mississippi and Ohio valleys. The heaviest rainfalls of the month occurred in the Gulf and Atlantic coast states under



the influence of advancing high areas, the cold air from which mingled with the warm, moist currents over the Gulf Stream, thereby giving rise to rapid and heavy condensation.

Low area number vii, of group number 2, and number viii, of group number 3, were attended with very heavy rainfalls and the most destructive floods of the month. Number vii developed over the middle plateau on the 13th and passed thence slowly northeastward to the Saskatchewan Valley, where on the 15th it changed its course to the eastward, and on the 17th to the southeastward, passing over Lakes Superior and Michigan, being central on the afternoon of the 18th over Lake Huron. At this juncture the depression was joined by low area number viii, which developed in southern Dakota on the 17th, as a secondary depression. While number vii was moving eastward over Manitoba, number viii moved into southern Nebraska, and thence northeastward to lower Michigan. On the 18th and 19th, while this combined depression was moving over the lower lakes, heavy precipitation and destructive floods occurred in southern and eastern Ohio, West Virginia, and western Pennsylvania. It was reported from West Virginia that the property of three entire counties in the western part of the state was almost completely destroyed, and more than thirty lives lost. This area disappeared south of Nova Scotia on the 21st.

The heavy rainfalls and floods in Iowa, Nebraska, central Kansas, northern Missouri, and northern Illinois, attended low area number vi which developed over the middle plateau on the 11th and passed thence eastward to the Mississippi Valley, where it was central on the morning of the 14th. Twenty-four hours later it was on the New Jersey coast, and thence moved directly out to sea.

The following are certain average monthly values of low pressure areas for a number of years: Number of storms (19 years), 9.8. Position first observed (17 years), lat. N. 45°.2; long. W. 99°.2. Position last observed (17 years), lat. N. 46°.0; long. 71°.9. Duration in days, 2.5. Position of middle of path (19 years), lat. N. 45°.7; long. W. (17 years), 85°.6. Length of path in degrees of longitude at its average parallel (17 years), 27°.4. Hourly velocity, in miles, of storm-centre along its average parallel (17 years), 23.3 miles. Hourly velocity, in miles, of storm-centre along its actual path (8 years), 24.3 miles. Minimum pressure (17 years) 29.63 inches.

Compared with the average values for many years the total number of depressions for July, 1889, shows an excess of 4.2. The place of beginning and ending shows a lower latitude, the former by 3°.2 and the latter by 1°. The average latitude of the entire paths shows a tendency southward by 2°.2. The duration of the depressions shows an increase of 2.2 days. The length of the tracks of the depressions show an increase of 7°.6. The velocity of progressive movement shows a decrease of 7.8 miles per hour, and the minimum pressure a decrease of .06 inch.

**Recapitulation.**—The prominent and significant features of low pressure areas for the month may be summarized as follows:

1. Permanent low pressure over the middle plateau.
2. A large increase in the number of depressions, being exceeded but once (15 areas in 1871) in 19 years, and equaled but once, 1872, in 18 years.
3. A marked diminution in the progressive movement east of the seventy-second meridian, owing to the presence of a persistent high pressure area off the Atlantic coast.
4. Excessive twenty-four hour rainfalls and general excess in precipitation in the Missouri Valley, east Gulf, and Atlantic coast states.
5. A marked excess in the duration of the depressions, in the length of their paths, but a decrease in pressure and in the velocity of progressive movement; which facts, taken in connection with the large increase in the number of depressions, point significantly to the excessive precipitation of the month.
6. The twelve-hour change in pressure was the maximum one for each depression during the month, and occurred between

8 a. m. and 8 p. m. in all cases, except for area number viii, when it took place between 8 p. m. and 8 a. m.

7. The twelve-hour change in temperature was the maximum one for each area during the month, and occurred between 8 a. m. and 8 p. m. in all cases, except for areas number i and xi, when it took place between 8 p. m. and 8 a. m.

The following tables exhibit the principal facts regarding these low areas:

TABLE NO. I.

No.	First observed.			Last observed.			Duration.	Velocity per hr.	Lowest pressure.		
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.				Date.	Station.	Reading.
I.....	1	45	102	45	56	5.5	18.0	3		Rockcliffe, Ont.....	Inches.
II.....	2	33	119	45	54	8.5	22.5	4		Salt Lake City, Utah...	29.60
III.....	3	52	116	43	102	3.0	18.8	4		Qu'Appelle, N. W. T. ...	29.42
IV.....	6	37	116	50	54	7.5	23.5	14-5		Anticosti, Gulf of St. L.	29.54
V.....	7	45	67	45	60	0.5	29.2	15		Bird Rocks, Gulf of St. L.	29.78
VI.....	11	38	114	40	73	3.5	30.2	15		Sydney, C. B. I. ....	29.64
VII.....	13	38	113	46	57	8.5	30.1	16		Atlantic City, N. J. ....	29.46
VIII.....	17	43	100	44	83	1.5	27.0	17		Qu'Appelle, N. W. T. ...	29.46
IX.....	18	39	101	34	74	4.5	19.1	18		Valentine, Nebr. ....	29.66
X.....	18	52	111	49	60	6.0	16.4	25		Rapid City, Dak. ....	29.64
XI.....	21	36	115	42	64	7.0	26.7	23		Fort Elliott, Tex. ....	29.44
XII.....	22	31	108	35	94	3.0	17.8	23		Anticosti, Gulf of St. L.	29.68
XIII.....	23	52	113	50	68	7.0	12.3	28		Salt Lake City, Utah...	29.66
XIV.....	29	51	117	52	98	2.0	28.1	30		El Paso, Tex. ....	29.76
Means.....	42.3	112	44.6	73.3	4.7	22.1				Fort Sill, Ind. T. ....	29.40
										Prince Arthur's Ldg. Ont.	29.52
										Medicine Hat, N. W. T.	29.52

TABLE NO. II.

Number.	Maximum fall in pressure for 12 hours.			Maximum abnormal rise in temperature for 12 hours.			Maximum wind velocity.		
	Amount.	Station.	Date.	Amount.	Station.	Date.	Miles per hour.	Direction.	Date.
1	.30	Rockcliffe, Ont.....	3	13	Father Point, Quebec	4	48	S.	1
2	.24	Winnemucca, Nev.....	5	17	Yuma, Ariz.....	3	30	se.	2
3	.58	Calgary, N. W. T.....	3	29	Denver, Colo.....	4	48	e.	3
4	.32	.....do.....	9	19	Fort Buford, Dak....	10	36	se.	11
5	.16	Eastport, Me.....	7	8	Eastport, Me.....	7	28	S.	12
6	.34	Calgary, N. W. T.....	12	12	Medicine Hat, N. W. T.	12	52	ne.	13
7	.20	Swift Current, N. W. T.	16	17	Qu'Appelle, N. W. T.	14	40	sw.	16
8	.25	Saint Vincent, Minn..	21	11	Atlantic City, N. J. ...	20	34	S.	17
9	.16	Minneapolis, Minn....	21	12	Fort Elliott, Tex.....	18	30	sw.	18
10	.26	Halifax, N. S.....	21	20	Olympia, Wash.....	19	40	w.	19
11	.18	Rio Grande City, Tex..	19	12	Pueblo, Colo.....	25	60	n.	25
12	.26	Swift Current, N. W. T.	23	10	Lynchburgh, Va.....	27	60	sw.	25
		Salt Lake City, Utah...	23	12	Denver, Colo.....	26	36	sw.	26
		Portland, Me.....	27	10	Fort Custer, Mont....	26	36	sw.	27
13	.32	Calgary, N. W. T.....	22	17	Helena, Mont.....	25	36	sw.	28
14	.42	.....do.....	29	22	Medicine Hat, N. W. T.	29	42	se.	31

Remarks concerning Table No. II.

I.—This depression is a continuation of low area number x in June REVIEW, central in northern Montana on the 30th ultimo.

II.—This area remained about stationary over California and the middle plateau from the 2d to the 6th, on which latter date it moved rapidly eastward to Nebraska. During the 7th and 8th the depression remained nearly stationary over the middle slope, but during the 9th moved eastward to Wisconsin. On the 11th it reached eastern New York, and the following day disappeared south of Nova Scotia.

III.—This area joined number ii in Nebraska on the 6th, but separated from it on the 7th and thereafter formed a distinct depression.

IV.—This area appeared over the middle plateau on the 6th and 7th and moved thence eastward to the upper lakes, over which region the depression was central on the 13th. By the morning of the 15th the area was central near Newfoundland, passing thence out to sea.

\*Departure from the current monthly average.



V.—This area probably appeared as the secondary effect of a large depression central south of Newfoundland.

VI.—This area reached the New Jersey coast on the 15th, passing thence eastward out to sea.

VII.—Developed over the middle plateau on the 13th and 14th, and moved thence northeastward over Montana to the Saskatchewan Valley where on the 16th it changed its course to the eastward and on the 17th to the southeastward, passing over the upper lakes, where on the 18th it joined with number viii over Lake Huron.

VIII.—This area developed in southern Dakota on the 17th as a secondary depression to number vii, then central in Manitoba. During the day it moved southward into Nebraska and thence eastward to the upper lakes, where on the 18th it joined with number vii over Lake Huron.

IX.—This area developed in west Kansas on the 18th, was central in northern Texas on the 19th, and moved thence eastward with diminishing energy to the Carolina coast, where it disappeared on the 22d.

X.—Developed in the Saskatchewan Valley on the 19th and moved rapidly eastward along the northern border of the country, passing the upper lakes on the 21st and reaching the Gulf of Saint Lawrence on the 23d.

XI.—This area developed over the middle plateau on the 21st and 22d and moved slowly eastward to the Missouri Valley, where on the 25th it joined with number xii in eastern Kansas.

XII. This area combined with number xi in Kansas on the 25th, and thereafter moved eastward as one depression, reaching the New Jersey coast on the 27th. On the 28th the depression disappeared south of Nova Scotia.

XIII.—Developing on the 24th north of Montana, this area moved slowly eastward, just north of the United States, reaching the lower Saint Lawrence valley on the 30th.

XIV.—This area sub-divided on the 31st, forming two centres of diminished energy, one being in Manitoba and the other in southern Dakota. It seems probable that these two centres joined in Minnesota in one depression on the following day.

#### NORTH ATLANTIC STORMS FOR JULY, 1889 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during July, 1889, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Seven depressions have been traced for July, 1889; the average number traced for the corresponding month of the last six years being seven and one-half. Of the depressions traced for the current month, three, numbers 3, 4, and 5, were continuations of areas of low pressure which first appeared over the North American continent; three are first charted over mid-ocean in high latitudes, and one apparently originated northeast of the Banks of Newfoundland. The movements of the depressions over the western part of the ocean were irregular, which fact may be attributed to the abnormally high pressure which prevailed during a considerable portion of the month to the east and southeast of the Banks of Newfoundland. No depressions with well-defined movements of translation appeared within the region of observation over the more southern portions of the ocean, the Gulf of Mexico, or the Caribbean Sea. Under date of July 23d, the Rev. Benito Vines, of the Belen College Observatory, Havana, Cuba, reports as follows: "Since Sunday, 21st, there have been observed indications of a cyclone in the first quadrant. This hurricane is moving in the beginning of its trajectory in the longitude of the Bahamas, in a direction toward the New Channel, in the vicinity of which it will probably recurve." The following dispatch was sent to the New York Herald from the City of Mexico, via Galveston: "July 12th, a terrific storm is raging at Vera Cruz, and the shipping there is in great peril. The Spanish bark 'Hijas de Vinas' is dragging her anchor. The officers of the Mexican man-of-war 'Libertad,' which is lying in the roadstead exposed to the whole fury of the gale, are doing all in their power to save their ship. Her anchorage is very insecure." Over the western portion of the ocean, north of the thirty-fifth parallel, fresh gales prevailed from the 5th to 17th, and 20th to 26th, attaining the force of strong gales on the 10th, 11th, and 15th to 17th, when the barometric pressure fell to about 29.50 (749). Over mid-ocean the stormy periods were embraced between the 1st to 9th, 17th to 20th, 23d, 24th, and 29th to 31st, strong gales being reported from the 5th to 8th, 17th and 18th, and the lowest barometric pressure, about 29.40 (747), on the 4th. Over the eastern part of the ocean, in the vicinity of the British Isles, unsettled weather prevailed from the 7th to 11th, 16th, 19th

to 26th, 30th and 31st, strong gales being reported on the 21st, 24th, and 25th, and barometric pressure falling to about 29.40 (747) being noted on the 24th.

Compared with the corresponding month of previous years the storms which appeared over the north Atlantic Ocean during July, 1889, corresponded closely in number with the average; they were deficient in energy, and pursued irregular paths, more especially over the western part of the ocean. A noteworthy feature of the month was the absence of storms of tropical or subtropical origin advancing northward over or east of the United States. The storms traced over the north Atlantic for July in preceding years varied in number from five in 1884 to twelve in 1886. The storms of the middle latitudes of the north Atlantic Ocean seldom acquire great strength in July, the most destructive storms of the month generally appearing in the tropical or subtropical regions. Among notable West-Indian storms for July described in the REVIEW during the last six years were those of 1886 and 1887. The hurricane of 1887 advanced from Barbadoes Island westward over the Caribbean Sea and thence northward over the Gulf of Mexico to the east Gulf states from the 20th to the close of the month. This storm was very severe at Barbadoes Island on the 20th, and several vessels were wrecked. Several vessels were wrecked on the west coast of Florida and the north Cuban coast, and very heavy rainfall in the Gulf States, in connection with high winds and swollen rivers, caused great destruction to the growing crops and the public highways. In 1886 two storms advanced northward from the vicinity of Cuba, neither of which were very destructive in their character.

The following are brief descriptions of the depressions traced for July, 1889:

1.—This depression was central over mid-ocean in about latitude N. 54° on the 1st, with central pressure falling to about 29.70 (754), and moderate to fresh gales, whence it moved northeasterly and disappeared north of the region of observation after the 2d.

2.—This depression appeared northeast of the Banks of Newfoundland on the 3d, with pressure about 29.60 (752), and thence passed southeast to about N. 47°, W. 38° by the 4th, in which position pressure falling to about 29.40 (747) was reported. By the 5th the centre of depression had advanced southeast to the forty-second parallel, whence it recurved northward to the forty-eighth parallel by the 6th, this movement being apparently due to the combined influence of an area of high pressure to the eastward and southward and the advance from the westward, south of Newfoundland, of an area of low pressure. By the 7th the storm-centre had moved westward to about the thirty-eighth meridian, after which it apparently united with



depression number 3 which moved eastward over the Grand Banks during the 7th.

3.—This depression was a continuation of low area vii-viii, and on the morning of the 7th was central south of Newfoundland, with pressure about 29.70 (754), and fresh gales from Nova Scotia to the Banks of Newfoundland. By the 8th the depression had moved rapidly eastward and was central in about N. 47°, W. 31°, with pressure about 29.60 (752), and fresh to strong gales. At noon, Greenwich time, of the 9th the storm-centre had advanced to the south of the British Isles, after which it passed east or northeast beyond the region of marine reports.

4.—This depression was a continuation of low area v which passed from near Cape Breton Island, where it was central on the 8th, southward to about the thirty-ninth parallel by the 9th, where central pressure about 29.65 (753) was shown. During the next twenty-four hours the depression changed its position but slightly, a marked decrease in pressure was, however, shown, and the attending winds increased to the force of strong gales. By the morning of the 11th the storm-centre had recurved northward to the forty-fourth parallel, the recurve being apparently occasioned by the presence to the eastward and southeastward of high barometric pressure. Remaining nearly stationary off Nova Scotia and Cape Breton Island until the 12th, the centre of depression is thence traced to southern Newfoundland by the 13th, after which it passed to the north of the Grand Banks by the 14th, and thence recurved southwest and united on the 15th north of Newfoundland with low area iv, which had advanced from the westward. By the 16th the centre of depression had moved westward and was located east of Anticosti Island, Gulf of Saint Lawrence, whence it passed eastward over Newfoundland and united on the 17th northeast of Newfoundland with depression number 5, which had advanced from the southwest. By the 18th the depression had moved north-northeast to the fifty-sixth parallel, and from this position passed eastward, attended by fresh to strong gales, and disappeared over the British Isles after the 20th.

5.—This depression was a continuation of low area vi which advanced eastward from the New Jersey coast during the 15th. By the 16th the centre of depression was located south-southeast of Nova Scotia, with pressure about 29.50 (749), and fresh to strong gales, whence it moved northeast and united with number 4 northeast of Newfoundland on the 17th.

6.—This depression appeared over mid-ocean in about latitude N. 57° on the 23d, to which position it had apparently advanced from the west or northwest, after which it moved rapidly eastward and disappeared over or north of the British Isles, attended by fresh and strong north to west gales to the forty-fifth parallel until the 26th.

7.—This depression pursued an irregular course west of the British Isles from the 29th to the close of the month, its presence being attended by moderate to fresh gales, and barometric pressure falling to about 29.50 (749) on the 30th.

#### OCEAN ICE IN JULY.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for July during the last seven years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
July, 1883.....	42 42	49 57	July, 1883.....	46 47	45 44
July, 1884.....	46 24	50 02	July, 1884.....	48 30	40 28
July, 1885.....	42 14	48 30	July, 1885.....	48 00	44 00
July, 1886.....	43 59	49 18	July, 1886.....	45 52	34 30
July, 1887.....	43 30	50 05	July, 1887.....	52 04	41 16
July, 1888.....	44 49	47 45	July, 1888.....	47 40	50 10
July, 1889.....	44 49	47 45	July, 1889.....	45 50	40 00

\* Off Cape Race. † An isolated iceberg and some field ice.

In July, 1889, the southernmost ice reported, which consisted

of a solid mass of ice bearing north (true) about ten miles from the position given, was nearly one degree north of the average southern limit, and the easternmost ice noted, a small iceberg, was about four degrees east of the average eastern limit of ice for the month. Ice was most frequently encountered near and east of Belle Isle, and along and off the northeast edge of the Banks of Newfoundland. No ice was reported in the immediate vicinity of southern Newfoundland, nor over the more southern and western parts of the Banks of Newfoundland. Compared with ice reported for June, 1889, the southern limit of Arctic ice for the current month was about two degrees farther north, while the extreme eastern limit was about the same. Compared with the corresponding month of preceding years the ice reported for July, 1889, about equalled the average in quantity, although in its distribution its absence from off southern Newfoundland and over a greater portion of the Grand Banks was unusual.

The following positions of icebergs and field ice reported are shown on chart i by ruled shading:

1st.—N. 52° 44', W. 51° 52', numerous large bergs between this position and Belle Isle; N. 52° 46', W. 50° 46', large bergs five to ten miles apart.

4th.—N. 52° 48', W. 52° 19', Arctic ice, large and small pieces.

5th.—N. 52° 22', W. 51° 05', numerous large and small bergs; N. 52° 37', W. 53° 16', several small bergs; N. 52° 00', W. 55° 10', numerous large and small bergs to Belle Isle; N. 51° 52', W. 54° 32' to N. 51° 56', W. 54° 10', twenty-six moderate and small-sized bergs; N. 52° 06', W. 54° 42', forty large and small bergs.

6th.—N. 47° 45', W. 46° 30' to N. 47° 20', W. 47° 30', five bergs, varying in height from seventy to eighty feet; N. 51° 50', W. 53° 11', a large berg; N. 52° 02', W. 51° 54', two moderate-sized bergs; N. 52° 04', W. 51° 39', a large berg; N. 47° 11', W. 47° 06', a berg with two peaks one hundred and fifty feet high.

7th.—N. 52° 11', W. 51° 15', a very large berg.

8th.—N. 45° 50', W. 40° 00', a small berg.

9th.—N. 47° 04', W. 47° 37', several pieces of ice; N. 46° 52', W. 47° 49', a berg; N. 44° 49', W. 47° 45', a solid mass of ice bearing north (true) about ten miles; from one hundred miles east-northeast of Belle Isle, a large number of bergs.

10th.—N. 47° 46', W. 49° 13', three large bergs; Cape Norman to N. 52° 10', W. 53° 50', ten large bergs.

11th.—N. 47° 21', W. 48° 00', a number of bergs in fog.

12th.—Off Belle Isle, several large bergs; from one hundred miles east of Belle Isle to the straits, a number of large and small bergs.

13th.—N. 51° 05', W. 57° 36', a large berg; off Point Amour, five large bergs.

13-14th.—Point Amour to N. 52° 22', W. 53° 25', several bergs; N. 51° 10', W. 57° 40' to N. 52° 18', W. 53° 44', numerous bergs.

14th.—N. 52° 00', W. 54° 45', two medium-sized bergs, and several bergs from this position through north channel Straits of Belle Isle, with dense fog all the way; off Belle Isle, five large bergs; Straits of Belle Isle to Point Amour, a large number of large bergs; N. 48° 06', W. 47° 14', several bergs and pack ice.

15th.—Two miles off Point Amour Light, two pieces of ice.

16th.—N. 48° 26', W. 49° 37', a rather large berg; N. 47° 40', W. 51° 00', four small bergs.

17th.—N. 48° 05', W. 47° 12', one medium-sized berg; N. 47° 28', W. 46° 29', a large berg with conical peak and projecting shelf; N. 47° 22', W. 45° 56' a very large berg.

18th.—N. 45° 34', W. 46° 18', one berg; Straits of Belle Isle, twenty large bergs and innumerable small pieces of ice.

19th.—N. 45° 46', W. 46° 00', a large berg; N. 48° 09', W. 46° 45', a large berg, estimated one thousand feet long and four hundred feet high; N. 48° 30', W. 46° 51', a berg; N. 52° 40', W. 50° 00', a berg; one hundred and sixty-eight miles east-northeast from Belle Isle to twenty miles southwest



from Greenly Island, some very large bergs, one being the largest ever seen by the captain or officers on the Atlantic; N. 48° 46', W. 46° 54', a large berg with pieces awash; N. 48° 33', W. 47° 30', a berg; N. 48° 20', W. 48° 02', a large berg; N. 46° 42', W. 47° 11', a small berg; N. 52° 44', W. 51° 50', several large and small bergs; from this position to N. 51° 09', W. 57° 25', on the 20th, large and small bergs, and numerous bergs about Belle Isle and in the straits; N. 52° 36', W. 53° 00', from this position to Belle Isle, a large number of bergs.

20th.—Belle Isle, five bergs; N. 46° 04', W. 45° 44', two bergs, one about one hundred and fifty feet, and the other about four hundred feet high; from Belle Isle through the straits, a number of very large bergs, many aground; N. 48° 45', W. 47° 40', a large berg; N. 55° 36', W. 45° 48', two bergs bearing north-northwest eight miles; N. 51° 13', W. 57° 10', three small bergs; passed several bergs, large and small, in the Straits of Belle Isle.

21st.—N. 52° 50', W. 52° 14', a large berg; N. 52° 15', W. 53° 40', a number of bergs, large and small; N. 48° 19', W. 47° 40', a large berg, partially obscured by fog.

23d.—N. 45° 27', W. 45° 33', a berg.

26th.—N. 52° 00', W. 54° 15', bergs of various sizes; Straits of Belle Isle thickly studded with bergs, reaching to forty-three miles west of Greenly Island, right in the track of vessels; a large number of bergs in the Straits of Belle Isle; also a large number to the eastward; the last one being about one hundred and sixty miles east-northeast of Belle Isle on 27th.

28th.—N. 47° 56', W. 46° 21', field of ice; N. 49° 05', W. 44° 01', six bergs of considerable size.

30th.—N. 47° 48', W. 45° 36', a piece of ice.

#### FOG IN JULY.

The limits of fog-belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on eighteen dates, as compared with nineteen dates for June, 1889, and twenty-eight dates for July, 1888. Between the fifty-fifth and sixty-fifth meridians fog was reported on ten dates, as compared with eighteen dates for June, 1889, and thirteen dates for July, 1888. West of the sixty-fifth meridian fog was reported on eleven dates, as compared with fifteen dates for June, 1889,

and thirteen dates for July, 1888. Compared with the preceding month there has been a decrease in fog-frequency west of the fortieth meridian, the decrease being most marked south of Nova Scotia. Over and near the Grand Banks fog was reported with the approach or passage of areas of low pressure, save on the 30th and 31st, when high pressure and variable winds prevailed. South of Nova Scotia fog was noted with the approach or presence of areas of low pressure, except on the 3d, 30th, and 31st, when the winds were variable or southerly and the pressure high in that region. West of the sixty-fifth meridian the development of fog attended the presence over the Gulf or Valley of Saint Lawrence or the Canadian Maritime Provinces of areas of low pressure, except on the 2d, 3d, and 30th, when high pressure and southeast winds prevailed off the coast of the United States.

The following are limits of fog-areas on the north Atlantic Ocean during July, 1889, as reported by shipmasters:

Entered.				Cleared.				Entered.				Cleared.			
Date.	Lat. N. Lon. W.			Lat. N. Lon. W.			Date.	Lat. N. Lon. W.			Lat. N. Lon. W.				
1	.....			47 15		40 13	18-19	46 40	52 56		44 42		61 50		
2	41 10		66 32	40 40		67 40	19-20	51 56	55 05		Off Point Amour.				
3	42 22		60 55	42 30		61 30	19-20	Off Belle Isle.			Cape Norman.				
3	42 22		65 17	42 30		68 23	19-20	53 44	48 32		55 00		42 18		
3-5	46 52		52 18	Halifax.			20	40 51	68 16		40 47		68 40		
4-5	42 24		61 45	44 46		54 49	20	39 40	71 00		40 02		71 08		
4-5	52 38		48 12	Near Belle Isle.			20-21	46 05	45 04		45 48		50 13		
4-5	53 49		48 38	52 01		55 00	20-21	40 20	68 55		40 16		69 45		
5	53 18		52 44	52 38		53 08	20-21	46 49	52 25		45 34		56 53		
5	44 50		56 30	43 00		57 00	20-21	44 15	56 30		42 00		63 10		
5-6	42 28		48 57	42 12		51 01	21	42 26	64 10		42 26		65 50		
6	46 01		50 06	45 07		54 05	21-22	43 20	64 18		40 40		67 25		
6-7	48 10		48 15	46 55		48 30	21-22	53 37	51 31		54 00		49 50		
7	48 20		47 54	47 44		49 55	22-23	43 10	65 40		42 35		68 40		
7	43 27		49 58	43 26		50 27	22-23	41 05	67 00		40 35		69 45		
10-13	47 42		47 00	44 29		57 30	22-24	46 16	44 12		45 00		51 46		
11	43 30		44 30	43 20		49 20	23	45 02	45 40		44 10		48 58		
12	43 00		49 00	42 45		50 00	24-25	44 31	47 24		44 08		48 49		
13	40 58		67 50	40 49		70 17	25-26	42 00	52 50		41 00		55 15		
13-14	42 18		64 36	Off Cape Cod.			29	41 05	66 57		40 46		68 35		
13-14	41 27		65 55	40 42		70 35	29-30	42 46	64 58		42 28		68 24		
13-15	53 25		46 45	51 05		57 30	30	44 25	52 20		44 40		51 40		
14	40 41		68 54	40 45		72 00	30	43 00	61 10		42 35		66 20		
14-15	42 00		66 00	39 48		70 00	30	42 30	63 00		42 28		67 15		
15	45 30		53 40	46 20		52 00	30-31	48 00	47 30		47 35		52 03		
15	42 20		49 30	41 11		51 02	31	44 33	49 37		42 12		61 30		
16	41 41		49 37	41 42		50 03	31	53 36	45 00						
16	48 30		47 00	49 10		44 10									

#### TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for July, 1889, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

In July, 1889, the mean temperature was highest in the lower valley of the Colorado River, where, at stations in adjoining parts of Arizona, California, and Nevada the values rose above 95°, the highest mean reading, 99°.8, being reported at Volcano Springs, Cal. On the Atlantic coast south of the thirty-third parallel, over the southern half of the east Gulf states, along the Mississippi River to Kentucky, at stations in Indian Territory and eastern and southeastern Texas, and in areas in central Missouri, central Kansas, northern Utah, northern Nevada, and the valleys of the Sacramento and San Joaquin rivers, Cal., the mean temperature was above 80°. The mean temperature was lowest along the California coast north of San Francisco, where it was below 55°; in the lower Saint

Lawrence valley, the British Possessions north of Montana, the north Pacific coast, and at stations in central Colorado, it fell below 60°, and was below 70° north of a line traced from southwestern New England irregularly westward over the Lake region to the upper Missouri valley, thence southward to south-central New Mexico, north-northwest to northeastern Washington Territory, and at stations west of this line continued southward along the Pacific coast to southern California.

The departures from the normal temperature for the month were small. East of the Rocky Mountains the mean temperature was below the normal, except in Nova Scotia, the lower Saint Lawrence valley, the eastern part of the lower lake region, the northeastern portion of the upper lake region, in adjoining parts of Alabama, Georgia, Tennessee, and the Carolinas, and east-central and southeastern Texas, where the readings were slightly above the normal. The mean values were also below the normal in southern New Mexico and Arizona, in western California south of the thirty-ninth parallel, and on the Pacific coast north of the mouth of the Columbia River. In the Rocky Mountain and plateau regions, and on the Pacific coast between the thirty-ninth parallel and the Columbia River, the month was somewhat warmer than the average July.

Considered by districts, the greatest average departure below the normal temperature occurred on the southeastern slope of the Rocky Mountains, where it was 3°.4; in the Florida



Peninsula the average departure below the normal temperature was 1°.7; in New England, 1°.6; in the upper Mississippi valley and the northeastern slope of the Rocky Mountains, 1°.5; in the middle Atlantic states, 1°.3; in the west Gulf states, the Ohio Valley and Tennessee, and the extreme northwest, 1°.0; in the south Atlantic and east Gulf states, the lower lake region, middle-eastern slope of the Rocky Mountains, Missouri Valley, and the middle and south Pacific coasts, less than 1°.0. The greatest average departure above the normal, 1°.9, occurred in the northern plateau region. In the middle plateau region and on the north Pacific coast the average departure above the normal was 1°.8; in the southern plateau region, 1°.1, and in the upper lake region, 0°.1. In the Rio Grande Valley the mean temperature was normal.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.		Below normal.	
Roseburg, Oregon.....	4.4	Fort Assiniboine, Mont.....	3.1
Olympia, Wash.....	2.9	Key West, Fla.....	2.8
Salt Lake City, Utah.....	2.4	Boston, Mass.....	2.6
Fort Apache, Ariz.....	2.3	San Antonio, Tex.....	2.3
Fort Elliott, Tex.....	1.4	Saint Louis, Mo.....	2.2

#### DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for July, 1889; (4) the departure of the current month from the normal; (5) and the extreme monthly means for July during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of July.	(2) Length of record.	(3) Mean for July, 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for July.			
						Highest.	Year.	Lowest.	Year.
<i>Arkansas.</i>									
Lead Hill.....	Boone.....	81.5	7	82.5	+1.0	84.2	1888	75.2	1882
<i>California.</i>									
Sacramento.....	Sacramento ..	73.1	35	68.3	-4.8	80.6	1854	68.3	1889
<i>Colorado.</i>									
Fort Lyon.....	Bent.....	79.1	19	76.6	-2.5	82.8	1868	72.3	1875
<i>Connecticut.</i>									
Middletown.....	Middlesex...	71.1	21	68.9	-2.2	75.4	1886	66.9	1860
<i>Florida.</i>									
Merritt's Island ..	Brevard .....	79.9	5	79.6	-0.3	80.8	1887	78.5	1886
<i>Georgia.</i>									
Forsyth.....	Monroe.....	82.2	15	81.5	-0.7	85.7	1881	78.3	1882
<i>Illinois.</i>									
Peoria.....	Peoria.....	78.4	33	76.6	-1.8	83.2	1887	71.2	1865
Riley.....	McHenry.....	71.6	33	69.6	-2.0	80.2	1868	65.5	1882
<i>Indiana.</i>									
Vevay.....	Switzerland ..	77.8	23	75.3	-2.5	84.3	1868	73.0	1869
<i>Iowa.</i>									
Cresco.....	Howard.....	71.3	16	69.7	-1.6	75.2	1874	65.4	1882
Monticello.....	Jones.....	73.0	35	73.2	+0.2	79.3	1868	63.2	1863
Logan.....	Harrison.....	75.6	15	74.0	-1.6	79.5	1881	69.8	1882
<i>Kansas.</i>									
Lawrence.....	Douglas.....	78.4	27	76.0	-2.4	85.1	1868	72.0	1882
Wellington.....	Sumner.....	78.4	10	77.6	-0.8	83.9	1879	73.0	1882
<i>Louisiana.</i>									
Grand Coteau....	Saint Landry ..	82.7	6	*	.....	85.4	1884	80.6	1886
<i>Maine.</i>									
Gardiner.....	Kennebec....	69.0	49	66.4	-2.6	72.6	1855	64.7	1884
<i>Maryland.</i>									
Cumberland.....	Allegany.....	72.0	29	73.6	+1.6	77.7	1887	67.4	1860
<i>Massachusetts.</i>									
Amherst.....	Hampshire....	70.8	53	68.8	-2.0	76.1	1887	66.4	1860
Newburyport....	Essex.....	69.2	11	68.1	-1.1	71.1	1882	67.5	1884
Somerset.....	Bristol.....	74.1	17	73.3	-0.8	77.9	1876	71.4	1884, '88
<i>Michigan.</i>									
Kalamazoo.....	Kalamazoo....	72.7	12	70.8	-1.9	77.8	1885	67.5	1884
Thornville.....	Lapeer.....	71.8	12	71.7	-0.1	76.2	1887	68.8	1884
<i>Minnesota.</i>									
Minneapolis.....	Hennepin....	71.2	24	71.0	-0.2	77.2	1866	65.8	1882
<i>Montana.</i>									
Fort Shaw.....	Lewis & Clarke	68.5	20	65.8	-2.7	74.1	1886	61.5	1884
<i>New Hampshire.</i>									
Hanover.....	Grafton.....	69.4	46	69.5	+0.1	72.4	1870	62.3	1844
<i>New Jersey.</i>									
Moorestown.....	Burlington...	75.3	26	72.7	-2.6	78.8	1863	70.6	1888
South Orange....	Essex.....	73.3	15	70.9	-2.4	77.8	1876	69.3	1884
<i>New York.</i>									
Cooperstown....	Otsego.....	68.5	35	66.9	-1.6	73.4	1854, '70	62.7	1860
Palermo.....	Oswego.....	69.6	35	68.4	-1.2	70.6	1864	62.3	1860
<i>North Carolina.</i>									
Lenoir.....	Caldwell.....	74.8	16	74.0	-0.8	77.7	1877	66.4	1884

#### Deviations from normal temperatures—Continued.

State and station.	County.	(1) Normal for the month of July.	(2) Length of record.	(3) Mean for July, 1889.	(4) Departure from normal.	(5) Extreme monthly mean temperature for July.			
						Highest.	Year.	Lowest.	Year.
Ohio.									
N'th Lewisburgh.....	Champaign ..	73.4	57	74.7	+1.3	81.0	1887	68.0	1835, '47
Wauseon.....	Fulton.....	72.8	19	71.4	-1.4	77.1	1887	67.7	1882
Oregon.									
Albany.....	Linn.....	66.0	11	69.9	+3.9	69.9	1889	63.2	1881
Eola.....	Polk.....	64.4	19	70.3	+5.9	70.3	1889	59.6	1888
Pennsylvania.									
Dyberry.....	Wayne.....	68.4	21	65.8	-2.6	72.6	1887	63.2	1865
Grampian Hills.....	Clearfield....	70.7	25	70.8	+0.1	76.8	1887	66.6	1884
Wellsborough.....	Tioga.....	70.7	10	68.6	-2.1	76.1	1881	66.7	1884
South Carolina.									
Statesburgh.....	Sumter.....	79.1	8	77.9	-1.2	84.0	1881	77.5	1882, '86
Tennessee.									
Austin.....	Wilson.....	79.5	21	79.3	-0.2	85.2	1879	71.6	1885
Milan.....	Gibson.....	78.2	6	77.6	-0.6	80.7	1887	75.6	1883
Texas.									
New Ulm.....	Austin.....	82.7	17	81.3	-1.4	85.0	1879	80.6	1880
Vermont.									
Stratford.....	Orange.....	69.6	16	68.3	-1.3	73.5	1887	67.0	1881
Virginia.									
Bird's Nest.....	Northampt'n	78.9	21	78.6	-0.3	84.0	1887	74.3	1871
Wisconsin.									
Madison.....	Dane.....	72.0	20	71.0	-1.0	75.8	1859	67.7	1884
Washington.									
Fort Townsend ..	Jefferson ....	61.8	15	61.4	-0.4	66.1	1875	58.7	1879

\* Report not received.

The above table shows that the mean temperature for July, 1889, was above the highest mean reported for the corresponding month of previous years at the stations named in Oregon. At Albany, with a record of eleven years, and Eola, with a record of nineteen years, the mean for the current month was 1°.0 and 0°.4 above the highest previous mean noted for 1886 and 1875, respectively. Unusually low mean temperatures are not shown by this table.

#### MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported at Signal Service stations was noted in the Gila, lower Colorado, and middle Sacramento valleys, where the values rose above 110°; the highest reading, 117°, being registered at Yuma, Ariz. Over a greater portion of the plateau regions south of the valley of the Columbia River, within an area extending from central Dakota southward over western Texas, and at Kitty Hawk, N. C., the maximum temperature rose to or above 100°. The lowest maximum temperatures were reported on the coast of California north of the thirty-eighth parallel, where they fell below 70°. At stations in Maine and the extreme southeast part of New England the maximum readings were below 80°. The following are maximum readings in the several states and territories where maximum temperature of 100° or over was reported, as shown by reports of United States Army post surgeons and state weather service and voluntary observers: Volcano Springs, Cal., 126°; Fort Mojave, Ariz., 120°; El Dorado Canyon, Nev., 119°; Saint George, Utah, 115°; Gibson, Kans., 114°; Fort Supply, Ind. T., and Fort Hancock, Tex., 111°; Fort Niobrara, Nebr., and Deming, N. Mex., 110°; Fort Lyon, Colo., 109°; Forts Sully and Bennett, Dak., 108°; Lead Hill, Ark., 107°; Powder River, Mont., and Fort Laramie, Wyo., 106°; Haywood, Wis., 105°; Columbus and Meridian, Miss., Grant's Pass, Oregon, and Spartanburgh, S. C., 104°; Dale Enterprise, Va., 103°; Wiggins, Ala., Thomasville, Ga., Boise Barracks, Idaho, McLeansborough, Ill., Blakeville, Iowa, Cameron, La., Lathrop, Mich., Miami, Mo., and Forts Spokane and Walla Walla, Wash., 102°; Farmington and Fort Snelling, Minn., and Utica, N. Y., 100°. At the following-named Signal Service stations the maximum temperature was as high, or higher, than has been noted for the corresponding month of previous years: Fort Elliott, Tex., ten years record, 6° above the highest previous temperature for July, noted for two or more years; Fort Grant, Ariz., ten years record, the same as maximum of two or more preceding years; Salt Lake City, Utah, sixteen years record, 2° above maximum of 1885; Los Angeles, Cal., thirteen years record, the same as maximum of



1884. At a majority of the older established Signal Service stations in New England the highest temperature for July was recorded in 1876; on the middle Atlantic coast, in Tennessee, the west part of the lower lake region, and at the more southern stations on Lake Michigan, in 1887; on the south Atlantic coast in 1879; in the Ohio Valley, in 1874 or 1881; in the upper Missouri valley, Montana, and Idaho, in 1886; in Arkansas and Indian Territory, in 1884; and on the north Pacific coast in 1885. In other districts the periods of occurrence of the highest temperature were irregular. Among extremely high temperatures reported for July in preceding years by United States Army post surgeons and voluntary observers are, 128° at Mammoth Tank, Cal., and 122° at Humboldt, Cal., in 1887; 119° at Fort Mojave, Ariz., in 1877, and at Fort Miller, Cal., in 1853. Among high temperatures for July at Signal Service stations, other than those given in the table of miscellaneous meteorological data, are 109° at Fort Gibson, Ind. T., in 1879; 111° at Fort Benton, Mont., in 1886; and 115° at Fort Bayard, N. Mex., in 1882.

The only regular station of the Signal Service reporting temperature below 32°, excepting Mount Washington, N. H., where 30° was registered, was Fort Klamath, Oregon, where the temperature fell to 24° on the 6th. At stations in central Montana, and at Cheyenne, Wyo., and Moorhead, Minn., the temperature fell below 40°. North of a line traced irregularly westward from Eastport, Me., to the upper Missouri valley, and thence irregularly south of west to San Francisco, Cal., the minimum temperature fell below 50°. The highest minimum temperatures were noted along the coasts of South Carolina, Georgia, Florida, the Gulf coast, and in the middle Gila valley, where they were above 70°. At the following-named stations the minimum temperature was as low or lower than previously recorded for July during the periods of observation: Port Huron, Mich., sixteen years record, 1° below the minimum of 1886; La Crosse, Wis., seventeen years record, the same as minimum of 1887; Des Moines, Iowa, eleven years record, 1° below minimum of 1882 and 1887; Dubuque, Iowa, seventeen years record, the same as minimum of 1882; Keokuk, Iowa, nineteen years record, 2° below minimum of 1873, 1880, and 1883; Fort Custer, Mont., ten years record, the same as minimum of 1883; Cheyenne, Wyo., seventeen years record, the same as minimum of 1882; North Platte, Nebr., fifteen years record, 3° below minimum of 1877 and 1882; Portland, Oregon, seventeen years record, the same as minimum of 1887. In Maryland, Virginia, the District of Columbia, and the Ohio Valley, the lowest temperature ever reported for July was generally noted in 1885; in eastern North Carolina in 1888; along the east Gulf coast in 1882; in Arizona in 1879; and on the north and middle Pacific coast in 1887. In all other districts the periods of occurrence were irregular. The reports of United States Army post surgeons and state weather service and voluntary observers show the following minimum temperature values of 32° or below, in July, 1889: Volunteer Springs, Ariz., 26°; Alma, Colo., 29°; Breckenridge, Colo., 25°; Dolly Varden Mines, Colo., 30°; Soda Springs, Idaho, 26°; Humboldt, Iowa, 32°; Fort Logan,

Mont., 31°; Camp Sheridan and Fort D. A. Russell, Wyo., 32° and 30°, respectively.

#### RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of miscellaneous meteorological data. The greatest monthly ranges occurred within an area extending from south-central Nebraska to southern Dakota, where they exceeded 60°. The monthly ranges generally exceeded 50° in the Red River of the North and upper Missouri valleys, over the middle, eastern, and north-eastern slopes of the Rocky Mountains, the northern and middle plateau regions, and from southwestern Arizona west of north over the San Joaquin and Sacramento valleys to central and eastern Oregon. The monthly ranges were least along the Gulf coast, where they were less than 20°, and were less than 30° along a greater part of the Pacific coast.

The following are some of the extreme monthly ranges:

Greatest.		Least.	
Fort Klamath, Oregon.....	68. <sup>0</sup>	Corpus Christi, Tex.....	17. <sup>0</sup>
Valentine, Nebr.....	62.0	Key West, Fla.....	18.0
Huron, Dak.....	60.0	Eureka, Cal.....	21.0
Boise City, Idaho.....	58.0	Port Eads, La.....	21.0
Fresno, Cal.....	57.0	Point Reyes Light, Cal.....	22.0

#### FROST.

The only report of frost injurious to vegetation during July, 1889, was received from Mr. Jesse E. Glick, voluntary observer at Coulter, Colo., who states that thin ice formed, and frost caused injury to vegetables during the night of the 2-3d.

Frost was noted during the month, as follows: *Colorado*: Coulter, 2d, 3d, 17th, 18th, 24th, and 28th. *Illinois*: Charleston, 26th; Sycamore, 27th. *Montana*: Sheldon, 2d, 8th. *Oregon*: East Portland, 1st; Fort Klamath, 1st, 6th, 31st. *Utah*: Beaver, 3d. *Vermont*: Lunenburg, 25th. *Kansas*: Tribune, 3d. *Michigan*: 24th, 25th in the northern sections.

#### TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for July, 1889:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
Boston, Mass.....	66.4	61.2	5.2	64.4	69.4
Canby, Fort, Wash.....	66.0	59.8	6.2	63.0	58.3
Cedar Keys, Fla.....	89.9	80.3	9.6	85.5	81.4
Charleston, S. C.....	87.2	79.0	8.2	82.6	81.4
Eastport, Me.....	51.6	40.4	5.2	50.0	60.7
Galveston, Tex.....	88.5	84.0	4.5	87.1	83.8
Key West, Fla.....	90.2	85.0	5.2	87.0	83.2
Nantucket, Mass.....	75.0	71.5	3.5	73.3	67.0
New York City.....	72.7	66.0	6.7	69.2	73.5
Portland, Oregon.....	77.8	68.2	9.6	73.8	70.4

#### PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for July, 1889, as determined from the reports of nearly 2,000 stations, is exhibited on chart iii. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

In July, 1889, the precipitation was greatest in areas in the Atlantic coast states from Massachusetts to South Carolina, in southwestern Vermont, northeastern Georgia, along the Gulf coast of Florida north of Tampa Bay, in north-central Alabama and the adjoining part of Tennessee, extreme southern Louisiana, northeastern and south-central Texas, central Arkansas, south-central Indiana, and south-central Nebraska and adjoining parts of Kansas, where it exceeded 10 inches, and where, at stations in south-central Connecticut, eastern Pennsylvania, northern and western New Jersey, and north-eastern Georgia, it was more than 15 inches, the greatest



rainfall, 20.45 inches, being reported from Diamond, Ga. At a majority of stations in the plateau regions between the Colorado and Columbia Rivers and over southern California little or no rain fell, while from the Pacific coast between San Francisco and Los Angeles, Cal., to northeastern Utah, north-central Nevada, and the San Joaquin and middle and lower Sacramento valleys, and from northwestern California to south-central Washington no precipitation was reported.

The precipitation for July, 1889, was generally above the normal in the Atlantic coast and Gulf states, the upper Mississippi valley, the upper lake region, the northeastern slope of the Rocky Mountains, the southern plateau region, and in areas in Arkansas, Kansas, Colorado, Nebraska, southern Dakota, and southwestern Oregon; elsewhere the precipitation was generally below the normal. The greatest excesses in precipitation occurred in areas from Massachusetts to Georgia, and in northeastern Illinois, where, at stations, they exceeded 5.00, the greatest excess noted, 12.33, being shown at New Haven, Conn. The greatest departure below the normal, 4.20, was reported at Hatteras, N. C. At Fort Supply, Ind. T., there was a deficiency of 3.17, while on the Gulf coast of New Brunswick, in central Tennessee, southeastern Michigan, and at La Crosse, Wis., and Moorhead, Minn., the rainfall was 2.00, or more, below the average for the month.

In districts where the precipitation was in excess the average percentages of the normal were about as follows: New England, 157 per cent.; middle Atlantic states, 186 per cent.; south Atlantic states, 115 per cent.; east Gulf states, 158 per cent.; west Gulf states, 156 per cent.; upper lake region, 121 per cent.; upper Mississippi valley, 114 per cent.; northeastern slope of the Rocky Mountains, 122 per cent.; and southern plateau region, 108 per cent. In districts where the precipitation was below the normal the percentages of the normal precipitation were about as follows: Florida peninsula, 86 per cent.; Rio Grande Valley, 31 per cent.; Ohio Valley and Tennessee, 94 per cent.; lower lake region, 69 per cent.; extreme northwest, 61 per cent.; Missouri Valley, 94 per cent.; middle eastern slope of the Rocky Mountains, 98 per cent.; southeastern slope of the Rocky Mountains, 73 per cent.; middle plateau region, 55 per cent.; northern plateau region, 89 per cent.; north Pacific coast, 6 per cent.; middle Pacific coast, 9 per cent.; and south Pacific coast, 5 per cent.

In the preceding month there was an excess of rainfall from New England and the lower lakes southward and southwestward to the Gulf of Mexico and thence northwestward to the middle eastern slope of the Rocky Mountains; in all other districts there was a deficiency of rainfall. For the current month the large excess of precipitation in the middle Atlantic states noted for the last three months has continued. Over the northeastern slope of the Rocky Mountains and in the southern plateau region, where in June but 50 per cent. and 60 per cent., respectively, of the normal amount of precipitation fell, there was an excess for July, while along the Pacific coast and over the middle and northern plateau regions the deficiency in rainfall continued through July. A notable feature of July, 1889, was the excessive precipitation which occurred in limited areas east of the Rocky Mountains, the excesses being most marked in western Connecticut, south-central Virginia, northeastern Illinois, central Arkansas, and north-central Kansas, and the irregular distribution of rainfall over the country. An explanation of the causes which operated to occasion the large departures above the normal in limited districts, while at neighboring stations deficiencies were noted, may be found in the discussion of areas of high and low pressure in this REVIEW.

#### DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for July, 1889; (4) the departure of the current month from the average;

(5) and the extreme monthly precipitation for July during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of July.	(2) Length of record, Years.	(3) Total for July, 1889.	(4) Departure from average.	(5) Extreme monthly precipitation for July.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		Inches	Years	Inches	Inches	Inches		Inches	
Lead Hill.....	Boone.....	6.03	7	2.80	-3.23	11.60	1883	1.15	1888
California.									
Sacramento.....	Sacramento..	0.02	39	0.00	-0.02	0.55	1860	0.00	*
Colorado.									
Fort Lyon.....	Bent.....	2.24	18	2.62	+0.38	6.30	1872	0.14	1874
Connecticut.									
Middletown.....	Middlesex...	4.19	27	13.43	+9.24	13.43	1889	1.54	1870
Florida.									
Merritt's Island..	Brevard.....	5.84	11	8.09	+2.25	11.72	1884	0.86	1883
Georgia.									
Forsyth.....	Monroe.....	4.26	15	8.21	+3.95	12.70	1887	0.32	1878
Illinois.									
Peoria.....	Peoria.....	3.95	33	7.64	+3.68	8.87	1860	0.47	1886
Riley.....	McHenry.....	3.86	38	3.44	-0.42	9.99	1862	0.51	1886
Indiana.									
Logansport.....	Cass.....	2.94	14	7.52	+4.58	7.52	1889	0.62	1886
Iowa.									
Vevay.....	Switzerland..	3.95	24	6.93	+2.98	9.80	1874	0.90	1869
Kansas.									
Cresco.....	Howard.....	4.61	16	2.86	-1.75	12.70	1883	1.60	1875
Monticello.....	Jones.....	4.40	34	4.23	-0.17	10.93	1883	0.60	1874
Logan.....	Harrison.....	5.45	23	6.28	+0.83	13.00	1878	2.20	1886
Louisiana.									
Lawrence.....	Douglas.....	4.37	24	6.34	+1.97	7.85	1861	0.11	1886
Wellington.....	Sumner.....	4.00	10	7.99	+3.99	7.99	1889	1.89	1884
Maine.									
Grand Coteau....	St. Landry..	4.44	6	4.28	-0.16	8.08	1886	1.89	1888
Massachusetts.									
Gardiner.....	Kennebec....	3.29	49	2.96	-0.33	6.96	1887	0.59	1864
Maryland.									
Cumberland.....	Alleghany....	3.70	17	2.74	-0.96	5.59	1887	1.01	1885
Michigan.									
Amherst.....	Hampshire..	4.49	53	9.49	+5.00	11.58	1874	0.96	1864
Newburyport.....	Essex.....	3.74	11	6.79	+3.08	6.90	1883	1.43	1882
Somerset.....	Bristol.....	3.73	17	6.38	+2.65	7.52	1880	2.04	1886
Minnesota.									
Kalamazoo.....	Kalamazoo..	3.55	13	4.82	+1.27	6.50	1877	0.79	1887
Thornville.....	Lapeer.....	3.27	12	1.90	-1.37	6.69	1883	0.47	1881
Montana.									
Minneapolis.....	Hennepin....	3.08	23	3.16	+0.08	6.26	1879	0.43	1877
Nebraska.									
Fort Shaw.....	Lewis & Clarke	1.07	19	0.56	-0.51	2.66	1884	0.00	71, 74
New Hampshire.									
Hanover.....	Grafton.....	3.42	43	5.48	+2.06	8.48	1877	1.24	1854
New Jersey.									
Moorestown.....	Burlington..	4.18	26	7.94	+3.76	7.94	1889	1.40	1882
South Orange.....	Essex.....	4.59	18	18.58	+13.99	18.58	1889	1.03	1881
New York.									
Cooperstown.....	Otsego.....	4.14	35	5.61	+1.47	7.92	1863	0.89	1868
Palermo.....	Oswego.....	3.26	35	3.61	+0.35	6.60	1874	0.64	1882
North Carolina.									
Lenoir.....	Caldwell.....	4.49	16	9.00	+4.51	9.10	1886	1.70	1884
Ohio.									
N. Lewisburgh..	Champaign..	5.06	17	3.25	-1.81	8.60	1876	1.60	1874
Wauseon.....	Fulton.....	3.80	17	4.82	+1.02	7.26	1872	0.31	1886
Oregon.									
Albany.....	Linn.....	0.60	12	0.00	-0.60	1.87	1884	0.00	*
Eola.....	Polk.....	0.51	17	0.00	-0.51	2.29	1884	0.00	*
Pennsylvania.									
Dyberry.....	Wayne.....	4.73	18	6.53	+1.80	9.28	1887	0.00	1868
Grampian Hills..	Clearfield...	4.99	18	7.33	+2.34	7.33	1889	3.35	1868
Wellsborough....	Tioga.....	7.20	10	3.06	-4.14	12.30	1880	3.06	1889
South Carolina.									
Statesburgh.....	Sumter.....	3.64	8	6.27	+2.63	6.27	1889	1.70	1884
Tennessee.									
Austin.....	Wilson.....	4.11	21	5.76	+1.65	10.13	1880	0.20	1881
Milan.....	Gibson.....	4.04	6	4.00	-0.04	8.51	1884	1.49	1888
Texas.									
New Ulm.....	Austin.....	4.09	17	2.13	-1.96	14.38	1873	0.00	1884
Vermont.									
Stratford.....	Orange.....	4.51	16	6.50	+1.99	6.77	1873	2.00	1881
Virginia.									
Bird's Nest.....	Northampton	4.06	20	8.40	+4.34	8.90	1877	1.25	1873
Wytheville.....	Wythe.....	4.02	24	6.69	+2.67	8.10	1861	0.89	1883
Wisconsin.									
Madison.....	Dane.....	4.56	20	2.12	-2.44	9.47	1881	0.79	1886
Washington.									
Fort Townsend..	Jefferson....	0.90	14	0.01	-0.89	4.41	1888	0.01	1889

\* Frequently.

Table of excessive precipitation, July, 1889.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.	
		Am't.	Day.	Am't.	Time.
		Inches.		Inches.	h. m.
Alabama.					
Citronelle.....		2.60	26		
Decatur (1).....		12.63	26		
Decatur (2).....		10.63			
Montgomery.....		2.83	3-4	2.35	0 57



Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Alabama—Continued.						
Montgomery	Inches.	Inches.		Inches.	A. M.	
New Market				1.10	0 55	30
Selma		3.00	7	1.06	0 13	12
Wiggins		3.00	26	3.00	2 00	26
Arizona.						
Banghart's Station		3.00	3			
Flagstaff		2.68	14	1.02	0 25	25
Fort Verde				1.70	1 10	19
Tucson		3.00	18-19			
Arkansas.						
Hot Springs				1.85	1 00	7
Little Rock		3.64	29	1.08	0 45	10
Pine Bluff		3.05	29			
Russellville	12.00	6.00	29			
Colorado.						
Rocky Ford		2.89	8	2.89	1 30	8
Connecticut.						
Birmingham	14.19					
Clark's Falls	10.58					
Hartford (2)	10.97					
Lake Konomoc	10.31					
Lebanon	11.37					
Mansfield	11.39					
Middletown	13.43					
New Britain	11.03					
New Hartford (1)	10.58					
New Hartford (2)	11.70					
New Haven	17.08	2.76	30	1.07	0 25	4
Do	17.08	3.81	30-31	1.34	0 25	23
North Woodstock	11.34					
Pomfret	11.53					
Shelton	15.55	3.80	30			
South Manchester	11.00					
Uncasville	11.16					
Wallingford	13.48	3.48	30			
Waterbury	10.83					
Dakota.						
Armour				2.15	1 05	11
Beulah		2.56	11	2.56	1 20	11
De Smet				2.20	2 00	7
Fort Meade				1.40	0 35	11
Spearfish				1.10	0 45	24
Spring Lake		3.00	7-8			
Steele				1.25	0 33	16
Webster		2.89	11			
Wolsey				1.59	1 00	25
District of Columbia.						
Washington Barracks		2.60	30-31			
Washington City		3.18	30-31			
Florida.						
Altamonte Springs	10.94					
Cedar Keys	10.03	2.99	2			
Fort Barrancas	12.35					
Jacksonville				1.09	1 00	18
Manatee	10.01	2.56	25			
Do		2.50	31			
Pensacola	10.78	2.38	10			
Georgia.						
Atlanta				1.13	1 00	2-3
Do				1.00	0 30	13
Do				2.22	1 10	20
Do				1.37	1 00	26
Augusta	10.10	3.93	25-26			
Columbus		2.99	30			
Diamond	20.45	4.10	3			
Do		3.20	27			
Do		2.60	28			
Duck	10.51					
Forsyth		3.25	2			
Hephzibah		4.90	25	4.90	4 00	25
Macon		3.40	27			
Milledgeville				2.47	2 00	3
Do				1.03	1 00	4
Do				2.30	2 00	26
Savannah		2.58	17			
Toccoa		3.70	4			
Waynesborough		2.60	28			
Illinois.						
Chicago		4.02	27	1.55	0 35	18-19
Do				4.02	3 34	27
Mattoon		2.50	14			
Peoria				2.15	1 00	19
Rock Island Arsenal		5.16	13	5.16	1 30	13
Windsor				1.54	0 45	18-19
Indiana.						
Angola		4.50	18			
Blue Lick		3.08	11			
Marengo	10.50	4.20	2			
Point Isabel				2.37	1 45	14
Rockville		3.00	18			
Salem		2.64	11			
Scalesville		2.55	12			
Veray				1.54	1 30	11
Iowa.						
Ames				1.00	0 45	8
Bancroft		2.50	8			
Davenport		5.18	13-14			
Dubuque				2.00	0 50	2
Dyers				2.40	1 30	16
Glenwood (2)		3.29	15			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.			
		Amt.	Day.	Amt.	Time.	Day.	
Iowa—Continued.		Inches.	Inches.	Inches.	A. M.		
Keokuk.....		3.64	2	2.34	1 45	2	
Do.....				1.10	0 35		
Le Claire.....		5.00	14				
Muscatine (1).....		4.10	13				
Muscatine (2).....		2.50	11-12				
Sac City.....		5.00	13	5.00	5 00		
Storm Lake.....		3.10	13				
West Bend.....		3.10	8				
Kansas.							
Belleville.....		4.10	23				
Bendena.....		3.94	10				
Burr Oak.....		11.75	13				
Do.....		4.00	23				
Cawker City.....		2.60	23				
Concordia.....		5.14	22-23				
Cunningham.....				1.23	1 55	26	
Elk Falls.....				1.33	1 00	23	
Englewood.....		3.70	9-10	1.71	1 00	19	
Fremont.....				1.08	0 35	21	
Globe.....		2.76	15-16				
Havensville.....		3.50	15-16				
Hill City.....		2.50	20				
Do.....		3.00	21				
Hoxie.....		3.00	20				
Hymer.....		2.88	23-24				
Independence.....		3.08	23-24	2.00	0 45	23	
Kirwin.....		11.30	6				
Do.....		4.30	23				
Lebo.....				2.01	1 10	9	
Manhattan (1).....		5.38	23				
Manhattan (2).....		4.40	23				
Manhattan (3).....		10.28	22				
Macksville.....		2.75	8				
Minneapolis.....		3.75	23				
Offerle.....				1.00	0 30	8	
Rome.....				2.00	1 00	8	
Sedan.....		3.06	22-23				
Shocky.....		2.50	18				
Stockton.....		4.50	23				
Topeka.....		2.66	22-23	1.52	1 20	23	
Toronto.....		3.07	23	1.22	1 00	23	
Wakefield.....		3.14	22-23				
Wellington.....		2.94	8				
Yates Center.....		3.07	23				
Kentucky.							
Bowling Green.....		2.75	28				
Earlington.....				2.30	1 30	11	
Franklin.....				1.60	1 30	3	
Lexington.....				2.00	1 16	14	
Owenton.....				1.04	1 00	20	
Shelbyville.....		2.53	14				
Louisiana.							
Cameron.....		2.86	10				
Houma.....		10.49	2	3.49	1 15	2	
Do.....		2.66	7	2.66	0 47	7	
Melville.....		3.25	30				
Monroe.....		3.87	22				
New Orleans.....				1.40	0 15	6	
Do.....				1.04	1 00	9	
Do.....				1.20	1 00	12	
Do.....				1.15	0 30	13	
Winnfield.....		10.38	26	1.98	0 50	6	
Maryland.							
Baltimore.....		11.03	3.63	1-2	1.01	0 45	30
Do.....			4.02	30-31			
Barren Creek Springs.....		12.48	3.52	26-27			
Fallston.....		12.37					
Fort McHenry.....		10.18	3.50	30-31			
Frederick.....			3.77	30			
Gambrell's.....		13.02	4.18	30-31			
Jewell.....		10.25	3.50	1-2			
McDonogh.....			2.53	1			
Massachusetts.							
Blue Hill (summit).....			2.60	27			
Mansfield.....		10.60					
Newburyport.....			2.65	20			
Royalston.....			2.62	19-20			
Do.....			2.78	29-30			
Taunton (1).....				1.27	1 15	23	
Michigan.							
Bronson.....			3.02	18			
Colon.....			4.59	18			
Marquette.....				1.22	0 32	21	
Noble.....			3.12	18			
Sturgis.....			4.90	18			
Traverse City (2).....			3.35	3			
Minnesota.							
Duluth.....				1.10	0 50	7	
Redwood Falls.....			2.78	17			
Mississippi.							
Macon.....			5.00?	23			
Missouri.							
Princeton.....			2.60	13-14			
Springfield.....				2.00	1 20	15	
Do.....				1.30	1 00	23	
Nebraska.							
Ansley.....			2.60	9			
Culbertson (2).....				1.46	0 25	19	
Holmesville.....			3.00	13			
Marquette.....		11.18					



Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Nebraska—Continued.						
Minden.....	13.20	Inches.	Inches.	Inches	A. M.	
North Loup.....	10.37	2.80	11			
North Platte.....		2.70	7-8	1.75	1 05	7
Omaha.....				1.77	1 30	8
Plattsmouth.....		2.50	16			
Superior.....	10.25	3.20	20			
Valentine.....				1.10	1 00	
New Hampshire.						
Mount Washington.....	13.18	3.86	19-20			
North Conway.....		2.66	20			
New Jersey.						
Freehold.....		3.05	30-31			
Gillette.....	12.31	4.00	30			
Hanover.....	11.83	3.81	30-31			
Highland Park.....	10.59	3.33	30-31			
Lambertville.....	10.38	4.47	30-31			
Locktown.....	13.06	3.64	19-20			
Madison.....	12.47	4.03	30-31			
Newark.....	14.60	5.31	30-31			
New Brunswick (1).....	10.45	3.01	30-31			
New Brunswick (2).....	10.35	3.71	30-31			
Oceanic.....		2.70	27			
Plainfield.....	15.52	6.61	30-31			
South Orange.....	18.58	3.23	19-20	5.40	3 00	30
Do.....		8.57	30-31	1.50	1 00	31
Tenafly.....	15.53	5.15	30-31			
Union.....	14.65	5.95	30-31			
Valley.....	11.21	3.18	30-31			
Trenton.....		3.28	30			
New Mexico.						
Springer.....				2.00	1 30	13
New York.						
Auburn.....		2.61	19			
Canton.....				1.22	0 25	1
David's Island.....	13.12	3.68	19-20			
Do.....		5.22	30-31			
Fort Columbus.....		2.57	26-27			
Fort Schuyler.....	10.09					
Kingston.....		3.10	31	1.66	1 00	9
New York City.....		2.77	26-27	1.05	1 00	27
Tannersville.....	10.20	3.78	19			
West Point.....		2.80	31			
White Plains.....	14.07	2.80	30-31			
North Carolina.						
Charlotte.....		3.30	26-27			
Grover.....				2.00	2 00	26
Lumberton.....		4.50	5			
Mount Holly.....		3.25	27			
Mount Pleasant.....		3.21	25			
Soapstone Mount.....	10.00	2.50	29			
Wadesborough.....		3.95	1			
Weldon (2).....	11.91	2.70	8			
Wilmington.....	11.10	3.32	1	2.60	1 00	1
Ohio.						
Athens.....		3.55	18			
Canton.....		3.50	18			
College Hill.....		3.00	19			
Logan.....	10.83	5.50	18			
Waverly.....		2.56	19			
Pennsylvania.						
Blooming Grove.....	11.00	2.70	29			
Coatsville.....	12.93					
Doylestown.....	11.87					
Eaton.....	10.48					
Forks of Neeshaminy.....	10.36					
Franklin.....		4.43	31			
Frederick.....	12.69					
Germantown.....	10.50					
Lansdale.....	15.02			1.50	0 45	13
Le Roy.....				2.30	1 00	13
Nisbet.....						
Ottaville.....	13.19					
Point Pleasant.....	12.30					
Pottstown.....	12.50					
Quakerstown.....	11.54					
Scisholtaville.....	11.76					
Smith's Corners.....	12.30					
West Chester.....	12.57					
York.....				1.75	0 45	13
Rhode Island.						
Pawtucket.....	10.68					
Woonsocket.....	11.41					
South Carolina.						
Cedar Springs.....		3.25	26	3.25	1 15	26
Charleston.....		4.14	27			
Cheraw.....	10.89	3.00	1			
Columbia.....		3.38	30			
Conway.....	10.31					
Hardeeville.....		2.60	6			
Jacksonborough.....		2.79	30			
Kirkwood.....		2.75	26			
Saint Matthews.....		2.54	25			
Yorkville.....		3.69	27			
Tennessee.						
Ashwood.....		4.37	13			
Columbia.....	11.73			1.06	0 58	28
Memphis.....				1.29	1 10	11
Ridgely.....						
Texas.						
Camp Peña Colorado.....		3.20	10-11			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Texas—Continued.						
Cedar Hill.....		Inches.	Inches.	Inches.	h. m.	
Cleburne.....	11.50	2.50	1			
Do.....		3.00	1-2			
Dallas.....		6.00	3-4			
Decatur.....	11.89	4.95	3			
Fort Clark.....		3.14	25			
Do.....	10.75	4.00	4			
Fort McIntosh.....		5.00	10			
Menardville.....		2.64	11			
San Antonio.....		3.30	10			
Waco.....				1.50	0 43	
Weatherford.....		3.20	11			
Utah.		2.50	3			
Losee.....		2.60	15			
Vermont.						
Jacksonville.....		2.68	20			
Stratford.....		2.50	19-20			
Vernon.....	11.02					
Virginia.						
Bird's Nest.....		2.90	4			
Fort Monroe.....	11.61	2.80	4-5			
Port Myer.....		3.10	31			
Lexington.....		2.55	30-31			
Lynchburg.....	10.94	3.21	30-31	1.62	0 55	11
Mossingford.....	11.74					
Norfolk.....	10.69					
University of Virginia.....	12.05	3.95	31			
West Virginia.						
Parkersburg.....		3.00	18-19			
Wyoming.						
Lusk.....				1.03	0 45	12
Mexico.						
Mazatlan.....				1.82	1 05	20
Do.....				1.30	1 20	20

Excessive precipitation received too late for publication in June.

<i>Colony of Surinam.</i>						
Burnside Corone.....	12.50			3.02		35

Precipitation to equal or exceed ten inches was reported at eighteen stations in Connecticut; fifteen stations in Pennsylvania; fourteen stations in New Jersey; and six stations in Maryland; in New Hampshire, Vermont, Massachusetts, Rhode Island, New York, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, Texas, Arkansas, Tennessee, Ohio, Indiana, Kansas, and Nebraska, at from one to five, inclusive. In states and territories other than those named precipitation to equal or exceed ten inches was not reported for July, 1889. The heaviest rainfalls, by states, for the month were: 13.18 at Mount Washington, N. H.; 11.02 at Vernon, Vt.; 10.60 at Mansfield, Mass.; 17.08 at New Haven, Conn.; 11.41 at Woonsocket, R. I.; 14.07 at White Plains, N. Y.; 18.58 at South Orange, N. J.; 15.02 at Lansdale, Pa.; 13.02 at Gambrills, Md.; 12.05 at University of Va.; 11.91 at Weldon, N. C.; 10.89 at Cheraw, S. C.; 20.45 at Diamond, Ga.; 12.35 at Fort Barrancas, Fla.; 12.63 at Decatur, Ala.; 10.49 at Houma, La.; 11.89 at Dallas, Tex.; 12.00 at Russellville, Ark.; 11.73 at Columbia, Tenn.; 10.83 at Logan, Ohio; 10.50 at Marengo, Ind.; 11.75 at Burr Oak, Kans.; 13.20 at Minden, Nebr. In July of preceding years rainfall to equal or exceed ten inches has occurred most frequently in Florida, where it was reported for thirty-one years; in Georgia for nineteen years; in South Carolina for seventeen years; in New York for fifteen years; in Kansas for thirteen years; in Iowa, Missouri, North Carolina, and New Hampshire for twelve years; in Louisiana for eleven years; in Alabama, Arkansas, Illinois, Indiana, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, New Jersey, Ohio, Pennsylvania, Texas, Virginia, and Wisconsin for from five to ten years, inclusive; in Arizona, Colorado, Connecticut, Dakota, Delaware, District of Columbia, Indian Territory, Kentucky, Maryland, New Mexico, Tennessee, and West Virginia for from one to five years, inclusive. In states and territories other than those named precipitation to equal or exceed ten inches has not been reported for July in preceding years. Among notable monthly rainfalls for July



are: 20.18 at Opelika, Ala., and 21.09 at Auburn, Ala., in 1887; 25.88 at Fernandina, Fla., in 1864; 22.24, 21.31, and 24.52 at Fort Brooke, Fla., in 1856, 1848, and 1840, respectively; 20.50 at Kentland, Ind., in 1869; 21.86 at Lake Hook, Minn., in 1872; 23.90 at Mount Washington, N. H., in 1884; 21.12 at Wilmington, N. C., in 1886; 28.11 at White, Tenn., in 1883. Exclusive of the instances cited, monthly precipitation to equal or exceed fifteen inches has been reported for seven years in Florida; for five years in Massachusetts; for three years in Kansas and Texas; for two years in Alabama, Arkansas, Georgia, Illinois, Iowa, Mississippi, Nebraska, New Hampshire, New Jersey, New York, North Carolina, and Virginia; and for one year in Indian Territory, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Missouri, Pennsylvania, and Wisconsin.

Precipitation to equal or exceed 2.50 inches in twenty-four hours was reported from the greatest number of stations, twenty-nine, in Kansas; at eighteen in New Jersey; at twelve in Texas; at eleven in Georgia; at from five to ten, inclusive, in New York, Maryland, Virginia, North Carolina, South Carolina, Alabama, Louisiana, Ohio, Indiana, Michigan, Iowa, and Nebraska; and in from one to four, inclusive, in New Hampshire, Vermont, Massachusetts, Connecticut, Pennsylvania, District of Columbia, West Virginia, Florida, Mississippi, Arkansas, Tennessee, Kentucky, Illinois, Missouri, Minnesota, Dakota, Colorado, Utah, and Arizona. In states and territories other than those named rainfall to equal or exceed 2.50 inches in twenty-four hours has not been reported. The heaviest rainfalls for one day, by states, for the month were: 3.00, at Selma and Wiggins, Ala., on the 7th and 26th, respectively; 3.00, at Bangharts, Ariz., 3d; 6.00, at Russellville, Ark., 29th; 2.89, at Rocky Ford, Colo., 8th; 3.80, at Shelton, Conn., 30th; 2.89, at Webster, Dak., 11th; 2.98, at Pensacola, Fla., 10th; 4.90, at Hepzibah, Ga., 25th; 5.16, at Rock Island Arsenal, Ill., 13th; 4.50, at Angola, Ind., 18th; 5.00, at Le Claire and Sac City, Iowa, 14th and 13th, respectively; 5.38, at Manhattan, Kans., 23d; 2.75, at Bowling Green, Ky., 28th; 3.87, at Monroe, La., 22d; 3.77, at Frederick, Md., 30th; 2.65, at Newburyport, Mass., 20th; 4.90, at Sturgis, Mich., 18th; 2.78, at Redwood Falls, Minn., 17th; 5.007, at Macon, Miss., 23d; 3.20, at Superior, Nebr., 20th; 2.66, at North Conway, N. H., 20th; 4.06, at Gillette, N. J., 30th; 3.10, at Kingston, N. Y., 31st; 4.50, at Lumberton, N. C., 5th; 5.50, at Logan, Ohio, 18th; 4.43, at Franklin, Pa., 31st; 4.14, at Charleston, S. C., 27th; 4.37, at Ashwood, Tenn., 13th; 5.00, at Fort Clark, Tex., 10th; 2.60, at Losee, Utah, 15th; 2.68, at Jacksonville, Vt., 20th; 3.95, at the University of Virginia, 31st. At Washington, D. C., 3.18 fell on the 30th and 31st; at Davenport, Iowa, 5.18 on the 13th and 14th; at Concordia, Kans., 5.14 on the 22d and 23d; at South Orange, N. J., 8.57 on the 30th and 31st; at David's Island, N. Y., 5.22 on the 30th and 31st; and at Cleburne, Tex., 6.00 on the 3d and 4th.

Precipitation to equal or exceed 2.50 inches in twenty-four hours in July has been reported most frequently in Kansas, where it has been noted for nineteen years; in Iowa for fifteen years; in Nebraska for fourteen years; in Indiana, North Carolina, and South Carolina for thirteen years; in Georgia, Pennsylvania, and Texas for twelve years; in Dakota, Florida, and Ohio for eleven years; in Alabama, Connecticut, Indian Territory, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Jersey, New York, Tennessee, and Wisconsin for from five to ten years, inclusive; and in Arizona, Arkansas, Colorado, Delaware, District of Columbia, Kentucky, Maine, Montana, New Hampshire, New Mexico, Oregon, Rhode Island, Virginia, and West Virginia, for from one to four years, inclusive. In states and territories other than those named rainfall to equal or exceed 2.50 inches in twenty-four hours has not been reported for July in preceding years. Among the heavier daily rainfalls reported for July in preceding years are: 7.50, Thomson, Ga., 28th, 1887; 7.50, Smithville, Ga., 12th, 1884; 10.00, Union Point, Ga., 29th, 1887; 8.00, Logan, Iowa, 10th, 1878; 7.75, Nashua, Iowa, 9th, 1881; 7.50, Fort Ripley, Minn., 18th, 1867; 7.21, Car-

thage, Mo., 24th, 1886; 7.61, Independence, Mo., 14th, 1885; 8.00, Pierce City, Mo., 1886; 12.00, Lambertville, N. J., 16th, 1865; 7.33, Wilmington, N. C., 15th, 1886; 7.00, Grace, Ohio, 9th, 1888; 7.00, Hulmeville, Pa., 26th, 1879. Exclusive of the instances and years cited, rainfall to equal or exceed 5.00 inches in twenty-four hours has been reported in Alabama in 1873 and 1887; in Arizona in 1878; in Dakota in 1871; in Georgia in 1886; in Illinois and Indiana in 1878; in Iowa in 1876; in Missouri in 1883; in New Jersey in 1887; in New York in 1874; in North Carolina in 1879 and 1884; in Ohio in 1879; in South Carolina in 1878; in Tennessee in 1883; in Texas in 1878, 1881, 1882, and 1888, and in Wisconsin in 1879.

Rainfall to equal or exceed the rate of one inch an hour occurred on eight dates in Georgia; six dates in Kansas and Louisiana; five dates in Dakota; four dates in Nebraska, Illinois, Kentucky, and Alabama; three dates in New York and Iowa; two dates in Arizona, Arkansas, Tennessee, North Carolina, Missouri, Indiana, Connecticut, and New Jersey, and on one date in Massachusetts, Pennsylvania, Maryland, Virginia, South Carolina, Florida, Michigan, Texas, Minnesota, Wyoming, Colorado, and New Mexico. In states and territories other than those named, rainfall to equal or exceed the rate of one inch an hour has not been reported for July, 1889. Among the heavier rainfalls reported for one hour or less are: 0.67 in ten minutes at Dubuque, Iowa, 2d; 1.08 in fifteen minutes at New Market, Ala., 12th; 1.40 in fifteen minutes at New Orleans, La., 6th; 1.34 in twenty-five minutes at New Haven, Conn., 23d; 1.46 in twenty-five minutes at Culbertson, Nebr., 19th; 1.22 in twenty-five minutes at Canton, N. Y., 1st; 5.16 in one hour and thirty minutes at Rock Island Arsenal, Ill., 13th; 2.00 in forty-five minutes at Independence, Kans., 23d; 2.66 in forty-seven minutes at Houma, La., 7th. In July of preceding years rainfalls to equal or exceed this amount in the period given have been most frequently reported in Kansas, where they have been noted for sixteen years; in Pennsylvania for fifteen years; in Iowa for fourteen years; in Illinois and North Carolina for twelve years; in Indiana, Nebraska, and Texas for eleven years; in Alabama, Florida, and Michigan for ten years; in Arizona, Arkansas, Dakota, Georgia, Louisiana, Massachusetts, Minnesota, Missouri, New York, Ohio, South Carolina, Tennessee, and Virginia for from five to nine years, inclusive, and in California, Colorado, Connecticut, District of Columbia, Indian Territory, Kentucky, Maine, Maryland, Mississippi, Montana, New Hampshire, New Mexico, West Virginia, Wisconsin, and Wyoming for from one to four years, inclusive. In the middle and northern plateau regions and along the middle and north Pacific coasts no rainfalls to equal or exceed the rate of one inch an hour have been reported in July in preceding years. Among the heavier rainfalls reported for one hour or less in July are, for ten minutes: 1.30, at Huron, Dak., 26th, 1885; 1.22, at Albany, N. Y., 10th, 1876; 0.50, at New York City, 27th, 1880; for fifteen minutes, 1.20, at Philo, Ill., 8th, 1888; 1.56, at Amana, Iowa, 31st, 1878; 1.00, at Saint Louis, Mo., 5th, 1848; 2.25, at Sandusky, Ohio, 11th, 1879; 1.00, at New York City, 13th, 1880; for twenty minutes, 1.90, at West Leavenworth, Kans., 21st, 1889; 2.00, at Amherst, Mass., 16th, 1879; 1.20, at Dunbarton, N. H., 27th, 1887; for twenty-five minutes, 1.60, at Jacksonville, Fla., 16th, 1888; 2.40, at Indianapolis, Ind., 12th, 1876; 1.78, at Wellsborough, Pa., 16th, 1880; for thirty minutes, 3.50, at Logansport, Ind., 7th, 1879; for forty minutes, 3.49, at Jacksonville, Fla., 6th, 1886; for forty-eight minutes, 2.90, at Nashville, Tenn., 8th, 1878.

#### MAXIMUM RAINFALLS IN ONE HOUR OR LESS.

The table shows that the greatest rate per minute for a five minute period was .09 of an inch at Chicago, Ill., on the 18th. The rate per minute for this period at the other stations given was, .06 at Savannah, Ga., 6th, and Washington, D. C., 1st and 15th; .05 at Detroit, Mich., 3d; Dodge City, Kans., 14th; .04 at Cincinnati, Ohio, 19th; New York, N. Y., 4th; and Saint Louis, Mo., 14th; .03 at Boston, Mass., 31st;



Jupiter, Fla., 22d. At Chicago, Ill., the rainfall of the 18th averaged .08 of an inch for ten minutes; at Savannah, Ga., .045 was averaged for ten minutes on the 17th, while at Washington, D. C., this rate of fall was recorded on the 1st. At the other stations named the greatest average rate of precipitation for ten minutes varied from .02 to .04 of an inch. The heaviest rainfall registered for one hour, 1.70, fell at Cincinnati, Ohio, on the 19th; 1.60 fell in one hour at Chicago, Ill., on the 18-19th, and 1.05 at New York, N. Y., on the 27th. At the other stations named the rainfall did not equal or exceed one inch an hour.

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		Inch.		Inch.	
Boston, Mass.	0.15	31	0.22	31	0.53	31
Cincinnati, Ohio	0.22	19	0.40	19	1.70	19
Chicago, Ill.	0.45	18	0.80	18	1.60	18-19
Detroit, Mich.	0.25	3	0.30	3	0.40	3
Dodge City, Kans.	0.25	14	0.35	14	0.52	14-16
Jupiter, Fla.	0.13	22	0.20	19	0.50	23
New York City	0.20	4	0.30	27	1.05	27
Savannah, Ga.	0.30	6	0.45	17	0.50	17
San Francisco, Cal.					T. *	
Saint Louis, Mo.	0.20	14	0.25	14	0.30	14
Washington, D. C.	0.30	1, 15	0.45	1	0.90	30

\* Total for month.

The above table is a record of the heaviest rainfalls during July, 1889, for periods of five and ten minutes, and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges.

#### HAIL.

Descriptions of the more severe hail-storms of the month are given under "Local storms." Hail was reported during the month as follows: 1st, Ariz., Mont. 2d, Ohio. 4th, Ariz. 6th, Mont., Nev. 7th, Dak., Nebr., Tex. 8th, Colo., Kans. 9th, Nebr., N. Y., Oregon. 10th, Colo., Mo., N. Y. 11th, Dak., Va. 12th, Ill., Iowa. 13th, Ariz., Dak., Ind. T., Nebr., Utah. 14th, Ind., Ind. T., Iowa, N. H., Va. 15th, Colo., Ind. T., N. J. 16th, Ariz. 17th, Ariz., Dak., Mass., Minn., N. H., Wash. 18th, Ariz., Kans. 19th, Ariz., Dak., Kans., Nebr., Wyo. 21st, Kans. 22d, Ariz., Kans., Mo. 23d, Ky., Mass., N. H., N. Y., Ohio, Vt. 24th, Dak., Kans., Mont., Nebr., Tenn., Wyo. 25th, Iowa, Minn. 26th, Ill., Ind., Kans., Minn., Wis. 27th, Ala., Ill., Iowa, Mich., Minn., Wis. 28th, Iowa, Ohio, Tenn. 29th, Ariz., Ill., Iowa, Mo. 30th, Ariz., Mich., N. Y. 31st, Ariz.

#### SNOW.

Turin, Lewis Co., N. Y.: reports state that snow flakes fell in this vicinity on the afternoon of the 15th.—*Turin, N. Y., Leader, 16th.*

#### WINDS.

The prevailing winds during July, 1889, are shown on chart ii by arrows flying with the wind. In New England, the middle Atlantic states, west Gulf states, upper lake region, Missouri Valley, middle, eastern, and southeastern slope of the Rocky Mountains the winds were mostly southerly; in the south Atlantic and east Gulf states, southwest; over eastern Florida, southeast to southwest; over the lower lakes and the southern plateau region, south to west; in the upper Mississippi valley, south to east; on the northeastern slope of the Rocky Mountains, northwest to southwest; over the middle plateau region and along the south Pacific coast, westerly; on the north Pacific coast, north to west; on the middle Pacific coast, south to west and variable; in the Ohio valley and Tennessee, the extreme Northwest, and the northern plateau region, variable.

#### HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour, other than those given in the table of miscellaneous meteorological data, were not reported.

#### LOCAL STORMS.

Severe storms were most frequently reported in Ohio, where they were noted for five dates; in Iowa and Massachusetts for four dates; in Dakota, Delaware, Mississippi, Pennsylvania, and Texas for three dates; in Colorado, Connecticut, Georgia, Illinois, Kansas, Louisiana, Maryland, Michigan, Minnesota, Nebraska, New York, Virginia, West Virginia, and Wisconsin for two dates; in Arkansas, Indiana, Kentucky, Maine, Missouri, New Hampshire, New Jersey, North Carolina, Oregon, and Tennessee for one date. In states and territories other than those named no severe storms have been reported. They were reported in the greatest number of states, seven, on the 30th, when they occurred in New Hampshire, Massachusetts, Connecticut, Delaware, New Jersey, Maryland, and Mississippi; in New York, West Virginia, Kentucky, Michigan, and Ohio on the 19th; in Massachusetts, Dakota, Iowa, and Minnesota on the 17th; in Michigan, Mississippi, Wisconsin, and Illinois on the 27th; in Massachusetts, Arkansas, New York, and Missouri on the 29th; in Maryland, Connecticut, Delaware, and Virginia on the 31st; in Indiana, Ohio, and Virginia on the 14th; in Iowa, West Virginia, and Ohio on the 18th; in

Georgia, North Carolina, and Minnesota on the 25th; in North Carolina and Ohio on the 1st; in Pennsylvania and Iowa on the 2d; in Texas and Pennsylvania on the 10th; in Delaware and Dakota on the 11th; in Colorado and Pennsylvania on the 15th; in Colorado and Kansas on the 22d; and in but one state or territory on the 2d, 3d, 5th to 7th, 9th, 20th, 21st, 23d, 24th, 28th. The following are descriptions of the storms referred to:

**1st. North Carolina.**—Wilmington: a severe thunder-storm, passing from southwest to northeast, accompanied by vivid and incessant lightning, began 11.45 a. m. and ended 1.50 p. m. The drainage being insufficient to carry off the water, several houses on Market and Front streets were flooded. **Ohio.**—Newark, Licking Co.: the heavy wind and rain storm this evening caused a washout in the Pan Handle track, eight miles east of this city, throwing eleven cars off the track.—*New York Daily Tribune, July 2.*

**2d. Pennsylvania.**—Tidioute, Warren Co.: a cloud-burst occurred one mile from this place at 6 p. m. and flooded the streets in this town to a depth of one foot. Maguire Run was swollen to mammoth proportions, and caused much destruction to public and private property.—*Times, Pittsburgh, Pa., July 4.* Titusville, Crawford Co.: a terrific thunder-storm occurred at 6 p. m. It was followed by two cloud-bursts, which caused a furious overflow in Church Run which winds through the city, flooding it in some places to the first stories of the houses. Estimated damage, \$15,000. Altoona, Blair Co.: a cloud-burst broke over this city at 10 p. m., doing great damage by the water bursting the sewers and overflowing the streets. The damage is widespread.—*Commercial Gazette, Pittsburgh, Pa., July 3.* Franklin, Venango Co.: this section was visited by a terrific wind and rain storm which caused great losses to the farmers and oil producers. Hundreds of derricks were blown down, and south of the city several barns were blown over, while the damage to growing crops is heavy.—*Post, Pittsburgh, Pa., July 4.* Iowa.—Dubuque: a storm, moving from northwest to east, began 3.40 p. m., attended by high wind, loud thunder, and vivid lightning. The rainfall for the first ten minutes was 0.67 inch; it subsided for about ten minutes and then fell heavier than before, 2.00 inches being recorded in fifty minutes. The sewers being insufficient to carry off the water, the streets were soon flooded. Three persons were struck by lightning, one being killed. The rain storm was



the severest that has occurred here for years, the damage in this city being estimated at about \$15,000.

**2-3d. Texas.**—Fort Worth, Tarrant Co.: heavy rain prevailed throughout the night, and on the evening of the 3d the water which surrounded this place was the highest since 1866. All the valley was flooded and covered with six feet of water. To the north the water extended two miles, and no railroads were above water except the Santa Fé. The loss to railroad and other property is at least \$1,500,000. Crops have sustained serious damage. A small village, containing eighteen houses, four miles northeast of this city, is completely washed away. Dallas, Dallas Co.: the rain of the past three days reached a climax on the afternoon of the 3d, when for one hour the heaviest rain for three years occurred. The water, in tremendous volumes, rushed over the sidewalks and into the stores, causing large damage to stocks.—*San Antonio, Tex., Express, July 4.*

**5th. Louisiana.**—Marksville, Avoyelles Parish: this section was visited by a severe storm at 2 p. m., which moved from northwest to southeast and partook somewhat of the characteristics of a tornado, demolishing out-houses and levelling crops in its path, which was about one-half mile in width.—*Report of Mr. Leon Molena.*

**6th. Louisiana.**—New Orleans: an unusually severe thunder-storm passed over this city between 10.20 a. m. and 11 a. m. The storm was accompanied by very heavy rain, which soon flooded the streets in the lower portion of the city.

**7th. Nebraska.**—North Platte: a thunder-storm, moving from west to east, began 4 p. m. and ended 10.30 p. m. Rain occurred almost throughout the storm, and from 4.40 p. m. to 5.45 p. m. it fell very heavily and was accompanied by hail, some of the hail-stones measuring one-half inch in diameter. Crops of all kinds were damaged by the hail. Maximum velocity of the wind, forty-eight miles per hour, at 5.10 p. m.

**9th. Oregon.**—Ashland: very heavy rain fell at this place between 8.30 and 10.15 p. m. It is reported that the storm was quite severe about four miles west of this city, where hail the size of marbles fell, causing much damage to orchards.

**10th. Texas.**—Del Rio, Val Verde Co.: the heaviest rain that has fallen here for years occurred this morning; it was accompanied by heavy thunder and lurid lightning. The Sencas, a small creek west of this place, overflowed its banks and washed away many fences. The Rio Grande was out of its banks and over a mile wide, causing destruction in the low lands. Several small bridges on the railroad between here and Devil's River have been washed away.—*San Antonio, Tex., Express, July 11.* **Pennsylvania.**—Greensburg, Westmoreland Co.: one of the most destructive storms known in this section passed over the northern portion of this county at 4 p. m. Rain fell in torrents, and the creeks overflowed for miles around the mining village of Crab Tree. Every bridge from Crab Tree to Saltsburgh has been carried away, and from two to three hundred yards of the Crab Tree Branch Railroad were washed away.—*The Palladium, Oswego, N. Y., July 11.*

**10-11th. Texas.**—Laredo, Webb Co.: heavy rain began during the afternoon of the 10th and continued until 8 p. m. of the following day. The storm appeared to be general, and, as a consequence, the Rio Grande River began rising about 5 a. m. of the 11th, and had risen twelve to fifteen feet up to 8 p. m. of the same day, causing some damage to property and bridges in this section. Eagle Pass, Maverick Co.: the heavy rainfall within the last twenty-four hours has done considerable damage along this valley. The Rio Grande rose twenty feet, at the rate of three feet an hour, and reached within six feet of the great flood in 1882, causing damage along its course. Extensive washouts occurred on the Eagle Pass branch.—*San Antonio, Tex., Express, July 12.*

**11th. Delaware.**—Laurel, Sussex Co.: a severe rain storm passed over this locality during the evening, doing considerable damage to growing crops.—*Baltimore, Md., American, July 13.* **Dakota.**—Fort Sully: heavy rain fell from 12.17 p. m. to 12.30 p. m., accompanied by large hail between 12.23

p. m. and 12.28 p. m. Hail-stones as large as a quarter-dollar silver piece, and very irregular and jagged in formation, fell. The wind, following the course of the storm, veered from northwest to northeast, and later to east.

**13th. Maryland.**—Westminster, Carroll Co.: the heaviest rain for many years visited this section at 4 p. m., and continued for about half an hour. Cellars were flooded and much damage was done by the flood in the surrounding country.—*The Sun, Baltimore, Md., July 15.* **Baltimore:** a thunder-storm accompanied by rain passed over this city from west to east between 11.25 a. m. and 1.15 p. m. The rain fell in torrents in parts of the city, causing great damage. The storm was most severe about three or four miles east of here, where many bridges were swept away, and crops were much injured by the heavy rain. **Iowa.**—Davenport: one of the severest storms known in this section began 9.12 p. m. and ended during the night. The rain fell in sheets, washing out sidewalks and making the streets impassable. The rainfall on the morning of the 14th measured 5.16 inches. The storm moved from the north and northwest to east, and was accompanied by hail and high northwest winds, the wind attaining a maximum velocity of thirty-six miles per hour. Reports from the surrounding country state that the crops sustained considerable damage, and that several bridges in this county were washed away. **Sac City, Sac Co.:** an unusually heavy rain occurred between 6.30 p. m. and 11.30 p. m., during which time 5.00 inches fell, washing out bridges, filling cellars, etc.—*Report of Dr. Caleb Brown.* **Maine.**—Bangor, Penobscot Co.: one of the most violent thunder-storms that ever passed over this section occurred in the evening. Several houses were struck by lightning.—*Portland, Me., Press, July 15.* **Nebraska.**—Stromsburg, Polk Co.: one of the severest storms experienced here visited this section at about 8 p. m. It was preceded by a high wind which caused much damage by demolishing and overturning smaller buildings; then followed the heavy downpour which converted the streets into canals of rushing water. During the height of the storm the dam of the artificial lake gave away, and the water swept over the adjacent country carrying everything before it. The damage to property and crops is very large. **Osceola, Polk Co.:** the worst storm of the season occurred at 6 p. m. Numbers of buildings sustained serious injury.—*The Omaha, Nebr., Herald, July 14.* **Clarks, Merriek Co.:** a severe wind and rain storm passed over this section at 5 p. m. Growing crops in the surrounding country are damaged to a considerable extent.—*The Omaha, Nebr., Republican, July 14.* **Tennessee.**—Williamsport, Maury Co.: an almost unprecedented rainfall occurred near this place during the day. The mill dams in Leatherwood Creek, Hickman Co., were swept away and fields were submerged.—*The Herald, Nashville, Tenn., July 16.*

**14th. Indiana.**—Evansville, Vanderburgh Co.: a heavy wind and rain storm passed over this city during the afternoon, doing much damage. The electric light wires, which had been blown down, charged buildings and pools of water with electricity, and several persons were shocked and rendered unconscious thereby.—*Cleveland, Ohio, Leader and Herald, July 16.* **Ohio.**—Princeton, Butler Co.: this town was almost demolished by a terrible wind and rain storm at 4 p. m. which continued about twenty minutes. The oats and corn crops in the surrounding country were ruined, and the village was deluged by water.—*Cleveland, Ohio, Leader and Herald, July 16.* **Virginia.**—Harrisonburgh, Rockingham Co.: this section was visited in the evening by a severe hail and rain storm, doing much damage in parts of the county. Corn is ruined and the land is badly washed.—*Baltimore, Md., American, July 16.*

**15th. Colorado.**—Colorado Springs: a heavy rain and thunder storm passed over the country around Palmer Lake this afternoon doing considerable damage. The Denver and Rio Grande track, one mile above Palmer Lake, was badly washed in several places.—*The Denver, Colo., Daily News, July 16.* **Pennsylvania.**—Reading: an unusually heavy rain



storm prevailed early this morning throughout the Lebanon Valley. A number of creeks overflowed; fields are submerged, and crops have been washed away. At the towns of Avon, Myerstown, and Lebanon the water entered the lower floors of a number of houses.—*Cleveland, Ohio, Leader and Herald, July 16.*

**17th. Massachusetts.**—The thunder-storm in eastern Massachusetts, this day, was accompanied by destructive hail. At Milton nothing equal to it had been seen in forty years, some stones being one and one-half inch long and three-quarters of an inch thick. The stones were commonly discoidal with radiate structure.—*Report of the New England Meteorological Society.* Lynn: the severest hail-storm that ever visited this city occurred at 1.15 p. m. For five minutes hail-stones as big as marbles fell, causing much damage to plants and greenhouses.—*Commercial Advertiser, Buffalo, N. Y., July 17.* Newburyport: this most remarkable hail-storm, occurring between 12.40 p. m. and 1 p. m., was in many places in this immediate neighborhood very destructive. Crops were cut down and ruined and other damage done. The path of destruction varied from one and one-half to two miles in width, and extended about six miles (as far as traced) in a generally southeasterly direction from the southeastern part of West Newbury, across the southwest point of Newburyport, through the central and west-central part of Newbury, into the confines of Rowley.—*Report of Mr. F. V. Pike.* Dakota.—Pembina, Pembina Co.: a damaging hail-storm occurred in this vicinity in the evening. The hail-stones were very large, and while the belt of land affected was narrow and the storm only of a few minutes duration, it did considerable damage to the wheat crop over an area of about 1,200 acres.—*The Pioneer-Press, Pembina, Dak., July 19.* Iowa.—Burlington, Des Moines Co.: a storm of unusual severity passed over this section at 3 a. m. The wind blew almost a gale, and rain descended in torrents for over two hours; the thunder and lightning were terrific. Reports state that a great many small bridges throughout the country were swept away, and that trains from the north and south were delayed by washouts. Crops sustained considerable injury.—*Republican and Leader, La Crosse, Wis., July 18.* Minnesota.—Saint Vincent: A severe hail and rain storm, accompanied by high wind, set in from the west at 7.55 p. m. Hail fell from 8.35 p. m. to 8.45 p. m., some of the hail-stones being about one-half inch in diameter; they were, however, too scattered to do any material damage at this place. The most destructive part of the storm passed about one mile north of this city in a direction north of east, where a strip of country, about half a mile in width was devastated. Reports state that hundreds of acres of wheat fields, in Dakota, were totally destroyed by the hail. The wind at this place blew at the rate of forty miles per hour for five minutes at 8.40 p. m.

**18th. Iowa.**—Shenandoah, Page Co.: a tornado formed about 4.30 p. m., six miles north of this city, and moved in a southeasterly direction. While under formation the lower edges of a large black cloud began revolving, forming an inverted cone and rapidly increasing in size, the point sinking lower and lower, rising and falling alternately during its passage, and tearing a path wherever it touched the ground. The path was from sixty to two hundred feet wide, and its entire length was about one and one-half mile. It was but two or three minutes in forming, and lasted not more than fifteen minutes.—*The Shenandoah, Iowa, Sentinel, July 19.* West Virginia.—Rockport, Wood Co.: a terrific thunder-storm, accompanied by torrents of rain and vivid lightning, passed over this section during the day. At this place 19.00 inches of rain was recorded in two hours and ten minutes, causing the Tygart Creek to rise at this point twenty-two feet in one hour. This village was almost entirely swept away, and the estimated loss at this place alone will reach \$75,000. The damage along Tygart Creek will amount to \$500,000, while the injury done on Tucker's Creek, Sandy and Slate rivers will not be less. A great many lives are reported lost in the flood.—*Report of Mr. R. D. J. Echols.* Parkersburgh: owing to the heavy rains on the 18th and 19th the Little Kanawha River rose very

rapidly during the 19th and 20th, carrying down the stream, during these two days, fully 50,000 logs and cross ties. Thirteen barges loaded with logs and cross-ties sunk at the mouth of the river on the 19th. Fourteen bridges, four of which were built of iron, were washed away in this county. The damage in this county alone is estimated at \$500,000, and this county has suffered less injury than either Wirt, Jackson, or Roane counties. Morristown, a small village in Wirt county, was entirely swept away by the flood, leaving only the wreck of one house where the village once stood, and nineteen people are known to have been drowned. Ohio.—Logan, Hocking Co.: the thunder-storm which occurred in the evening was the severest known here for years. The rain fell in torrents for four hours, while the thunder and lightning were terrific. A number of houses in the eastern or the lower portion of the city were submerged, several bridges were washed away, trains delayed, and great damage was done to crops in valleys. Waverly, Pike Co.: the heaviest rain known here visited this section during the evening. Eight or ten miles north of this city a cloud-burst occurred, deluging the surrounding country. Several hundred feet of the Ohio canal bank were washed out, and one hundred feet of the aqueduct at Stony Creek went down, and the big stone culvert at Indian Creek burst. Chillicothe, Ross Co.: the worst disaster that has befallen this city since the great fire of 1851, which swept away half the town, was the thunder and rain storm which burst upon the city at 9 p. m., and continued for four hours. In many residences the water was from six inches to three feet deep on the first floor. Reports show that the Ohio and Erie Canal broke in many places, inundating farmlands. The storm was quite general for several miles around this city. On the Scioto Valley Railroad, near Higby's station, this county, a trestle went down. On the Cincinnati, Washington, and Baltimore Railroad, a few miles east of here, there are several washouts and a number of large bridges are down. The village of Vigo, twelve miles east of here, was nearly ruined by the flood. Several houses floated from their foundations and many horses and cattle were drowned. At Massieville, five miles south of this city, the village was submerged and many houses were torn from their foundations. The inhabitants abandoned their homes and escaped to the hills. Reports from the country districts state that the storm carried off vast quantities of unthreshed wheat, growing corn, and other crops. The loss in this particular was very heavy.—*The Enquirer, Cincinnati, Ohio, July 20.*

**19th. New York.**—Little Falls, Herkimer Co.: a terrific rain storm swept over the southeastern portion of this county in the evening. The storm was most destructive in the village of Newville and along Nowadaga and Indian Castle creeks, where houses and barns were swept away by the torrents, together with several iron bridges. The waters in the Nowadaga Creek rose fourteen feet in about as many minutes, causing a flood, which swept everything before it.—*New York Daily Tribune, July 21.* Kentucky.—Hopkinsville, Christian Co.: one of the most destructive thunder-storms in years passed over this section during the evening. Reports of serious damage are being received from different parts of this county.—*Saint Louis, Mo., Post-Dispatch, July 21.* West Virginia.—Charleston, Kanawha Co.: a cloud-burst occurred on Elk River this morning causing a great deal of damage to lumbermen and farmers.—*The Chronicle, La Crosse, Wis., July 20.* Michigan.—Alpena: a severe thunder-storm, moving from west to southeast, passed over this city between 4.30 a. m. and 6.30 a. m. The lightning struck and set fire to a mill. Ohio.—Cincinnati: a severe thunder-storm, accompanied by heavy rain, passed over this city at 3 a. m. The Ohio Canal broke at York street, and a number of persons were rescued with difficulty. The storm was general in the state. Lightning set fire to the small village of Georgesville, Franklin Co., and one-half of the town was burned.—*The Chronicle, La Crosse, Wis., July 20.*

**20th. Massachusetts.**—East Brookfield, Worcester Co.: a



destructive thunder-storm, accompanied by high wind, occurred in the evening. It extended throughout the central and western portion of the state, causing considerable damage to fruit trees and small buildings. At Spencer, this county, the lightning damaged the switchboard and other appurtenances in the telephone exchange, besides burning out nearly all the local lines of the New England Telephone and Telegraph Exchange Company.—*New York Daily Tribune*, July 21.

**21st. Illinois.**—Jacksonville, Morgan Co.: a severe wind and rain storm passed over this county in the evening, prostrating growing crops, buildings, and trees. Several horses and cattle were killed, and a number of persons seriously injured.—*Evening Herald*, Duluth, Minn., July 23.

**22d. Colorado.**—Denver: a heavy rain fell in the evening, damaging the streets and flooding cellars. The storm was general throughout the state, and great damage was done to crops and railroads. The Santa Fé and Rio Grande roads were washed out in several places between here and Pueblo.—*Duluth, Minn., Daily News*, July 24.

**22-23d. Kansas.**—Concordia: unusually heavy rain fell from 5 p. m. to 6.15 p. m., 22d. Light thunder was heard at 2.15 a. m., 23d, and rain began soon afterwards and continued until 4.25 p. m. The rain was the heaviest that has fallen here in many years, 5.14 inches being recorded in twenty-four hours, flooding many streets and cellars. 24th: bottom lands for about three or four miles in this section were submerged. Most of this land is under cultivation, and the crops have been greatly damaged. The trains on most of the railroads leading to this city have been delayed by washouts.

**22d, 23d, and 24th. Kansas.**—Independence, Montgomery Co.: the heavy rain during these days caused the Verdigris to overflow its banks in places, which, with the back water in the smaller streams, has done considerable damage to the growing corn and wheat in stack and shock.—*Report of J. M. Altaffer to the Kansas State Weather Service*.

**23d. Kansas.**—Topeka: the heavy rain which prevailed during the greater part of the day caused the Shunganunga Creek to overflow its banks, flooding bottom lands and the lower portion of this city and washing away sidewalks, etc.

**24th. Dakota.**—Deadwood: the heaviest rain that has visited this section for years occurred in the evening, causing Wood Creek to swell very high, and doing much damage to the bridges on the Deadwood Central Railroad. The storm was accompanied by thunder and lightning, and in some parts by hail.—*Evening Herald*, Duluth, Minn., July 26.

**25th. Georgia.**—Hephzibah, Richmond Co.: a thunder-storm, which began 8 p. m. and ended at midnight, was attended by a continuous roar of thunder, brilliant lightning, and unusually heavy rain, 4.90 inches of rain being recorded in four hours.—*Report of Robert L. Rhodes*. Augusta: an unusually heavy thunder and rain storm, which, according to reports, was confined to an area of twenty square miles around this city, began 8 p. m. and ended 2 a. m. the following day. The rain fell in sheets from 8.30 p. m. to 10 p. m., in that time 3.00 inches having fallen. The rain caused considerable injury to crops, and the Augusta, Gibson, and Sandersville Railroad sustained some injury by washouts, the Whitehead trestle, fourteen miles from this city, being swept away.—*The Augusta, Ga., Chronicle*, July 27. **North Carolina.**—Wilmington: it is reported from Taylor's Bridge, Sampson Co., that the heaviest rain ever known at that place occurred between 6.30 a. m. and 9 p. m. Three mills were carried away; estimated damage \$3,000. **Minnesota.**—Litchfield, Meeker Co.: this section was visited during the day by a number of short but severe rain storms. One of them, in the southern portion of the county, was accompanied by hail which was very destructive to the wheat and other crops.—*The Daily Pioneer Press*, Saint Paul, Minn., July 27. **New Prague, Scott Co.:** a storm, about one hundred feet in width, passed half a mile west of here this afternoon. One house and five wheat laden railroad cars were destroyed. Crops in the path of the storm were demolished. **Morristown, Rice Co.:** a severe hail and electric

storm passed over this vicinity this afternoon. Several buildings were demolished. At Anoka, Anoka Co., the storm was unusually severe. Much damage is reported from the surrounding country.—*The Chronicle*, La Crosse, Wis., July 26.

**26th. Georgia.**—Cumming, Forsyth Co.: a cloud-burst occurred near this place late in the evening, causing considerable damage. A mill dam was washed away, carrying with it the mill, cotton-gin, and other machinery. The most damage was done to the corn crop, acres of which were washed away.—*Savannah, Ga., Morning News*, July 31.

**26-27th. Wisconsin.**—Prairie du Chien, Crawford Co.: during the severe hail, rain, and wind storm late in the afternoon of the 26th, and another of greater magnitude the following morning, the streets became deluged with water and hail was lying in drifts in the streets. The crops in the surrounding country sustained serious damage from the hail. The dam across the mouth of Saint Feriole was swept away.—*Evening Wisconsin*, Milwaukee, Wis., July 27.

**27th. Michigan.**—Hamilton, Allegan Co.: one of the most destructive storms that ever visited this region burst over this village at 6.30 p. m. The storm came from the west and was accompanied by wind, hail, and lightning, blowing down buildings, &c. Hail fell in great quantities, some of the hail-stones having a diameter of one and one-half inch, doing great damage to crops. Corunna, Shiawassee Co.: a thunder and wind storm of unusual severity passed over this county in the evening and did great damage to crops and buildings. Grand Ledge, Eaton Co.: a severe wind, rain, and hail-storm swept over this vicinity during the evening, flooding fields and knocking down oats and corn. Reports from Saint John's, Clinton Co., state that the storm was of a similar nature at that place.—*Detroit, Mich., Free Press*, July 30. **Lansing:** a thunder-storm, accompanied by vivid lightning, began at 8 p. m. and ended during the night. The rainfall was very heavy between 8.30 p. m. and 9.20 p. m., and the wind attained a maximum velocity of thirty-eight miles per hour at 8.45 p. m. from the southwest. Reports show that crops and orchards in this vicinity were considerably damaged. **Mississippi.**—Natchez, Adams Co.: a violent wind storm passed over this city in the afternoon, accompanied by considerable rain. It prostrated telegraph wires, and caused much damage to the growing cotton and corn.—*The Evening Post*, Vicksburg, Miss., July 30. **Wisconsin.**—Milwaukee: the storm of wind, hail, and rain that visited the southern portion of the state in the afternoon was very destructive, and reports from many localities state that the growing crops were almost totally ruined. One account, from the northern part of Walworth county, says that an area of seven miles in width from north to south, and twelve miles long, was devastated by the storm, so that the crops will be comparatively worthless.—*Milwaukee Journal*, Milwaukee, Wis., July 30. **Clinton, Rock Co.:** the tobacco in this vicinity was destroyed by the severe hail-storm in the afternoon. **Delavan, Walworth Co.:** a heavy storm of rain and hail passed over this section in the evening, doing considerable damage to the grain and tobacco crops. Several fine fields of tobacco near Darien, this county, were entirely destroyed. **Palmyra, Jefferson Co.:** the violent rain storm which occurred in the evening was accompanied by hail-stones as large as marbles, damaging the tobacco and other crops. **Ashland, Ashland Co.:** a destructive wind storm passed over this city in the afternoon. Over 150,000 feet of lumber, piled up on the docks along the bay, were blown into the Chequamegon. The big refuse burner of the Superior Lumber Company, costing \$10,000, was blown down and completely wrecked; much other damage to property was done.—*Evening Wisconsin*, Milwaukee, Wis., July 29. **Illinois.**—Chicago: a very destructive thunder-storm, accompanied by lightning and unusually heavy rain, occurred between 6.40 p. m. and 10.30 p. m. From 7.06 p. m. to 10.40 p. m. 4.02 inches of rain fell, which is the heaviest rainfall recorded here since the opening of the Signal Service station in 1870. Large hail fell in the southern and western portions of the city. The damage done by the



storm in this city is estimated at over one million dollars, and several lives were lost by falling buildings. The storm moved from southwest to northeast.

**28th. Ohio.**—Findlay: a destructive storm of wind, hail, and rain swept over this city in the evening. The wind was very high, and the rainfall heavy, while hail as large as hickory nuts fell. It was the most destructive storm of the year, and the loss to property is likely to be very great.—*The Daily American, Nashville, Tenn., July 30.*

**29th. Massachusetts.**—North Wilbraham, Hampden Co.: an unusually high wind, immediately followed by a terrific rain storm, occurred late in the afternoon, doing considerable damage to property. Public thoroughfares were badly washed in the western portion of the state.—*New London, Conn., Day, July 30.* **Arkansas.**—Clarksville, Johnson Co.: the heaviest rain on record at this place began about midnight 28-29th, and continued until 8 a. m. 29th. All the streets in the city were under water from six inches to five feet, and people took to the hills for safety. The damage in the city, however, was very slight, but in the country, especially in the creek bottoms, crops were blown and washed down. The railway bridges, culverts, and tracks were badly washed. The damage done by the flood in this county is estimated at \$50,000. Fayetteville, Washington Co.: the most terrific storm known here swept over this county during the morning. The thunder was a loud, unceasing roar, with lurid lightning, and the rain poured down in torrents. Much damage was done throughout this county to crops and property; Center Township alone estimates its loss at \$10,000. The Illinois Creek rose four feet higher than ever known, and crops along its banks were swept away. The Fort Smith railway bridge over White River was washed away, and damage was done to the Pacific and Great Eastern railway bridge at Wyman. Distressing reports of loss of property come from every direction.—*The Arkansas Gazette, Little Rock, Ark., July 30.* **New York.**—Saratoga Springs: the heaviest rain and wind storm of the summer burst over this place at 2 p. m., and in less than an hour one inch and one-half of rain fell. The sewers being inadequate to carry off the water, the cellars in the lower portion of the city were flooded. Adjacent villages report that the storm was also very severe.—*Post-Express, Rochester, N. Y., July 30.* **Missouri.**—Springfield: a thunder-storm, moving from southwest to southeast, began 2.38 a. m. and ended 2.54 a. m. The storm was accompanied by excessive rain and large hail. The hail-stones consisted of solid globes of ice, some of them measuring three inches in diameter. The smaller stones when cut in two exhibited a radiated structure.

**29-30th. Mississippi.**—Duck Hill, Montgomery Co.: the rainfall during the evening of the 29th and throughout the following day was the heaviest for years in this section. All the large streams have overflowed their banks, and thousands of acres of cotton and corn are submerged.—*Republican, Saint Louis, Mo., July 31.*

**30th. New Hampshire.**—Concord, Merrimack Co.: a destructive storm passed over the southern portion of this city at about noon, the damage of which can hardly be estimated. The storm was confined to narrow limits, and its course was a little south of east, having none of the characteristics of a

tornado. The wind blew with a tremendous velocity, and seemed to gather strength as it progressed, tearing up immense trees by the roots. *Report of Mr. William L. Foster.* Manchester: a severe thunder-storm, accompanied by rain at intervals, occurred between 1.40 p. m. and 2 p. m. The heavy rain washed the streets badly in many places, and cellars and basements were flooded. The storm moved from southwest to northeast. **New Jersey.**—Newark, Essex Co.: the most destructive storm that has visited this section occurred this afternoon and evening. In this city cellars were flooded and sewers burst, and work had to be suspended in the factories in the lower section of the city. A washout occurred on the Morris and Essex Railroad, at South Orange, and several buildings, including the post office, were carried away. In Orange Valley the water is up to the second story. Bloomfield and Mount Clare also report great damage to property, caused by the flood. Plainfield, Union Co.: the greatest flood ever known here followed the unusually heavy rain this afternoon, and a number of washouts and broken dams are reported. At 4 p. m. Coddington's dam, on Stony Brook, gave away and the large body of water carried off several ice-houses and other buildings along its course. The great cut on the Jersey Central Railroad at Fanwood was also flooded this afternoon.—*Ledger and Transcript, Philadelphia, Pa., July 31.* **Massachusetts.**—Haverhill, Essex Co.: the storm which visited this section at 2.30 p. m., came suddenly and with almost a hurricane force. It passed along in a belt half a mile wide, uprooting trees and damaging crops. Pittsfield, Berkshire Co.: the heavy rain which has prevailed since the 27th caused a washout to-day on the Housatonic, and Boston and Albany railroads.—*Argus, Portland, Me., July 31.*

**30-31st. Maryland.**—Baltimore: unusually heavy rain occurred at intervals between 7.20 p. m. 30th and the evening of the 31st, 4.02 inches having fallen during the twenty-four hours ending 7.20 p. m. 31st. A great deal of damage was done to roads and crops, and a small washout occurred on the Maryland and Central Railroad. **Connecticut.**—New Haven: a thunder-storm, moving from southwest to northeast, occurred at 1.35 p. m. 30th. The storm was accompanied by heavy rain, which continued at intervals until 3.30 p. m. the following day, 6.15 inches having fallen during the twenty-four hours ending 3.30 p. m. 31st. Dams and bridges were carried away, and other casualties done by the flood in this section. Damage estimated at \$1,000,000. **Delaware.**—Wilmington: during the past forty-eight hours the entire Delaware and Chesapeake peninsula has suffered from tremendous rain storms, which have resulted, in many sections, in disastrous floods and washouts. The low lying districts in this city are inundated. The worst feature of the heavy rains is the damage to crops in the lower part of the state and on the lower peninsula. The Baltimore and Delaware Bay Railroad, between Clayton and Bombay Hook, is damaged by washouts.—*Ledger and Transcript, Philadelphia, Pa., August 1.*

**31st. Virginia.**—Lynchburgh: rain began at about midnight and continued until 3.15 p. m. It began again at 5.15 p. m. and ended 7.40 p. m.; in that time 2.96 inches had fallen. The James River rose ten or twelve feet during the day. Washouts are reported at Indian Rock, Botetourt Co., on the Richmond and Alleghany Railroad.

## INLAND NAVIGATION.

### FLOODS.

The following reports show that the most disastrous floods of the month occurred near Lynchburgh, Va., on the 2d; at Johnstown, N. Y., on the 9th; at Austin, Tex., on the 12th; and in parts of east-central and southeastern Pennsylvania, and at Middletown, Conn., on the 31st.

Lynchburgh, Va., 2d: the east bound express on the Norfolk and Western Railroad ran into a washout this morning, three

miles from here, and was completely wrecked. It is reported that between thirty and forty passengers were killed.—*The Palladium, Oswego, N. Y., July 2.*

Johnstown, Fulton Co., N. Y., 9th: a destructive flood swept down the valley of Cayadutta Creek in the evening, drowning a number of persons and destroying a great deal of property. The water rose fifteen feet in a few minutes and overflowed the surrounding country. At this place ten people are missing



and four bodies have been recovered. The stone bridge was swept away at 7 p. m.; two iron bridges of the Johnstown, Fonda, and Gloucester Railroad were wrecked, and seven or eight other bridges were carried away.—*Evening Wisconsin, Milwaukee, Wis., July 10.*

Austin, Travis Co., Tex., 12th: heavy rains west of here have swollen all the streams, and the Colorado at this point is higher than for twenty years, and is still rising at the rate of ten inches per hour. Plantations on the bottom lands are overflowed, causing heavy loss. Two spans of a new iron bridge below the city have been carried off.—*Union and Advertiser, Rochester, N. Y., July 12.*

Utica, Oneida Co., N. Y., 18th: Herkimer Creek rose very rapidly during the day and soon flooded the village of Schuyler's Lake, Otsego Co. The West Shore tracks at Indian Castle and Little Falls are under water, and the wires are down. The tracks of the Delaware, Lackawanna, and Western are washed out in many places between here and Norwich.—*Union and Advertiser, Rochester, N. Y., July 20.*

Trinidad, Las Animas Co., Colo., 19th: at about 2 p. m. the Purgatory River began to rise very rapidly, and in one hour overflowed the banks in many places in the western portion of the city. The loose work of a bridge under construction was carried away.—*Denver Colo., Republican, July 20.*

Fredonia, Wilson Co., Kans., 26th: the water in the flooded Fall River bottoms at this place rose at the rate of two inches an hour. The river in places was seven miles wide, and the water twenty feet deep. The heavy iron bridge was carried off on the evening of the 24th.—*Commercial-Advertiser, Buffalo, N. Y., July 26.*

Middletown, Middlesex Co., Conn., 31st: for the last six days it has rained almost steadily. Much damage is reported, and crops are badly injured in the outlying districts. Factories were flooded and compelled to shut down. It was reported that the dam of the Metropolitan Wringer Company at Middlefield went down. Forty feet of the Air Line Railroad near here, and the Valley Railroad this side of Chester were washed out.—*The Evening Post, New York City, August 1.*

Philadelphia, Pa., 31st: the water in the Schuylkill River attained the highest point reached in this city for twenty years, involving a destruction to property estimated at from \$10,000 to \$20,000. The park drives were flooded and the streets near the river banks were under water to a depth of from four to five feet. The coffer-dam of the new Reading Railroad bridge was washed away, entailing a loss of \$5,000. All work at the Manayunk and the Pencoyd iron works was

stopped, owing to the encroachment of water.—*The Evening Post, New York City, August 1.*

Norristown, Montgomery Co., Pa., 31st: the Schuylkill at this point was higher than it has been since 1869, being seventeen feet above low-water mark. The water overflowed portions of the lumber yards, and the Reading Railroad tracks below this city were entirely submerged. At various other places the tracks of this road were under water. Vast quantities of logs, fencing, and grain floated down the stream. Easton, Northampton Co., Pa.: the Lehigh and Delaware rivers at this point rose rapidly. Navigation was suspended, mills closed, and trains on the Lehigh Valley and Jersey Central railroads delayed by the flood.—*Ledger and Transcript, Philadelphia, Pa., August 1.*

The following table shows the danger-points at the various stations; the highest and lowest water for July, 1889, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, July, 1889 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, La.....	29.9	16, 17, 18	17.6	31	13.4	4.2
<i>Arkansas River:</i>						
Fort Smith, Ark....	22.0	29	14.3	20	3.7	10.6
Little Rock, Ark....	23.0	31	17.7	18, 19, 20, 21	5.8	11.9
<i>Missouri River:</i>						
Fort Buford, Dak....	.....	1	7.0	27, 31	2.9	4.1
Sioux City.....	.....	1, 2	21.6	29, 30	19.7	1.9
Omaha, Nebr.....	18.0	1	9.7	31	8.4	1.3
Leavenworth, Kans.	20.0	22	11.5	17	8.3	3.6
Kansas City, Mo....	21.0	27	13.8	15, 16	10.2	3.6
<i>Mississippi River:</i>						
Saint Paul, Minn....	14.5	26	2.9	5, 7, 8	2.0	0.9
La Crosse, Wis....	24.0	3	4.4	29, 30, 31	2.5	1.9
Dubuque, Iowa....	16.0	3	4.8	31	2.7	2.1
Davenport, Iowa....	15.0	14	3.9	31	2.0	1.9
Keokuk, Iowa....	14.0	18	4.6	31	2.4	2.2
Saint Louis, Mo....	32.0	1	15.5	16, 17, 18	10.9	4.6
Cairo, Ill.....	40.0	1	27.7	10, 11	20.5	7.2
Memphis, Tenn....	34.0	1	25.3	13	15.9	9.4
Vicksburg, Miss....	41.0	3	34.4	21, 28, 29	21.3	13.1
New Orleans, La....	13.0	7	11.8	30, 31	6.9	4.9
<i>Ohio River:</i>						
Pittsburgh, Pa.....	22.0	5	10.8	26, 28	2.2	8.6
Parkersburg, W. Va.	38.0	20	12.8	30	6.0	6.8
Cincinnati, Ohio....	50.9	23	25.2	16	13.6	11.6
Louisville, Ky.....	25.0	24	9.7	19	6.8	2.9
<i>Cumberland River:</i>						
Nashville, Tenn....	40.0	31	14.7	18, 26	5.0	9.7
<i>Tennessee River:</i>						
Chattanooga, Tenn.	33.0	31	9.2	26	3.5	5.7
<i>Monongahela River:</i>						
Pittsburgh, Pa.....	29.0	5	10.8	26, 28	2.2	8.6
<i>Savannah River:</i>						
Augusta, Ga.....	32.0	29	16.3	25	6.5	9.8
<i>Willamette River:</i>						
Portland, Oregon....	15.0	13	6.2	21, 22	3.3	2.9

## ATMOSPHERIC ELECTRICITY.

### AUORAS.

Auroras were observed during the month, as follows: 1st, Rolling Green, Minn.; South Canisteo, N. Y. 2d and 3d, South Canisteo, N. Y. 5th, Gardiner, Me.; South Canisteo, N. Y. 7th, Beallville, Ohio. 9th, South Canisteo, N. Y. 11th, Gardiner, Me.; Mount Washington, N. H.; South Canisteo, N. Y. 12th and 13th, South Canisteo, N. Y. 15th, Mount Washington, N. H.; Quakertown, Pa. 16th, Wauseon, Ohio. 17th, Webster, Dak. 18th, Gardiner and Orono, Me.; Mount Washington, N. H. 20th, Gardiner, Me.; Newburyport, Mass.; Alpena, Mich.; Saint Vincent, Minn.; Hanover, N. H. 21st, Webster, Dak.; South Canisteo, N. Y. 22d, Webster, Dak. 23d and 24th, South Canisteo, N. Y. 25th, Woodbury, N. J. 26th, Gardiner, Me. 30th, Webster, Dak.; Marquette, Mich.; Hayward, Wis.

Saint Vincent, Minn.: a singular phenomenon was observed between 11 p. m. and midnight of the 20th. A small patch of luminous cirrus clouds appeared a little south of the zenith, drifting slowly toward west-northwest. About 11.45 p. m.

streaks of similarly luminous clouds were seen arranged in a straight line across the sky, presumably visible portions of an auroral band, extending from 20° south of east to 15° north of west, and passing 8° or 10° south of the zenith; these streaks lasted but a few minutes. A very faint auroral arch was seen from about 9 p. m. to midnight. It extended from about azimuth 160° to 250°, and altitude 12°. The night was misty near the horizon, but the sky was free from clouds.

Alpena, Mich.: an aurora, covering 30° of the horizon and extending to altitude 15°, was observed in the north at 8.45 p. m., 20th. It consisted of a white light, with a few small streamers having an apparent motion from north to east. The display ended at midnight.

### THUNDER-STORMS.

The more severe thunder-storms of the month are described under "Local storms." Thunder-storms were reported in the greatest number of state and territories, thirty-nine, on the 13th and 14th; in thirty-two on the 23d and 29th; in thirty-one on the 19th; in thirty on the 10th, 11th, 17th, and 20th; in twenty-nine on the 12th and 21st; in from twenty-five to



twenty-eight, inclusive, on the 1st, 2d, 3d, 9th, 15th, 24th, 26th, 27th, 28th, and 30th; in from nineteen to twenty-four, inclusive, on the 7th, 8th, 16th, 18th, 22d, and 25th; and in from thirteen to seventeen, inclusive, on the 4th, 5th, 6th, and 31st. There were no dates for which thunder-storms were reported in less than thirteen states and territories.

Thunder-storms were reported on the greatest number of dates, thirty-one, in Florida; on twenty-nine in Arizona; on twenty-eight in Dakota; on twenty-seven in Alabama; on twenty-five in Iowa, Kansas, Louisiana, New York, and Texas; on twenty-four in Mississippi, Nebraska, Ohio, and Tennessee; on twenty-three in Georgia and Minnesota; on twenty-two in

Illinois, Michigan, and South Carolina; on twenty-one in Indiana, and Missouri; on from fifteen to twenty, inclusive, in Arkansas, Colorado, Indian Territory, Kentucky, Maryland, Montana, New Jersey, North Carolina, Pennsylvania, Virginia, and Wisconsin; on from ten to fourteen, inclusive, in Massachusetts, New Mexico, Utah, Vermont, West Virginia, and Wyoming; on from five to nine, inclusive, in Connecticut, Maine, Nevada, New Hampshire, and Oregon, and on from one to four, inclusive, in California, Delaware, District of Columbia, Idaho, Rhode Island, and Washington Territory. There were no states or territories in which thunder-storms were not reported for one or more dates.

### MISCELLANEOUS PHENOMENA.

#### FOREST FIRES.

Albina, Multnomah Co., Oregon, 17th: dangerous forest fires have been burning for the last week in this county and in the southern part of Washington Territory. The fires have caused losses which will aggregate \$750,000. Showers of sparks and cinders are flying over this place.—*Post-Express, Rochester, N. Y., July 17.*

Fort Assiniboine, Mont., 28th: forest fires are reported in the spurs of the Rocky Mountains west of this place.

Chico, Butte Co., Cal., 29th: forest fires are raging on the Humboldt Road, eighteen miles from this place. The fire has burned over a district four miles in length, and destroyed much valuable timber.—*Post-Express, Rochester, N. Y., July 29.*

Fort Benton, Mont., 29th: forest fires are raging in the mountains and along the banks of the Missouri for many miles below here. The Northern Pacific track east of Livingston, Park Co., was burned out for a short distance. Several mining camps have been deserted, and ranchers are plowing around their land to prevent the fire from spreading.—*Union and Advertiser, Rochester, N. Y., July 29.*

Glenwood Springs, Garfield Co., Colo., 30th: the forest fire which has been burning in this vicinity for several days past covers an area of over ten square miles. The air over the entire western slope is filled with smoke from the burning fires in the mountains.—*The Palladium, Oswego, N. Y., July 30.*

Sierra City, Cal., 30th: large forest fires are raging in this section.—*The Morning Call, San Francisco, Cal., July 31.*

Gunnison, Colo., 30th: for the last two or three days the mountains in this vicinity have been ablaze with burning timber. The fires are supposed to have started from sparks of locomotives.—*Oswego, N. Y., Daily Times, July 30.*

Susanville, Lassen Co., Cal., 31st: forest fires have been burning for the last two months to the north and west of this city, doing considerable damage to stock ranges and timber land.—*Report of T. B. Sanders.*

Boisé City, Idaho, 31st: extensive forest fires are reported in the mountains about forty-five miles north of this city. The fires have taken such proportions that the governor of the territory has requested aid from the Interior Department at Washington City in extinguishing them.

Helena, Mont., 31st: extensive forest fires have been raging in this section for the past ten days, destroying what little grass was spared by the long and protracted drought.

Forest fires were also reported as follows: Red Bluff, Cal., northeast and west of this city, 12th, 13th; San Diego, Cal., 29th, 30th; Linkville, Oregon, 26th, 28th; Roseburgh, Oregon, 27th, 31st; Port Angeles, Wash., 19th.

#### HALOS.

Solar halos were most frequently reported in Tennessee, where they were noted on thirteen days; in Illinois on eleven days; in Iowa, Kansas, Massachusetts, and New York on from five to nine days, and in Arkansas, Dakota, Georgia, Idaho, Indiana, Maryland, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, Ohio, Oregon, Pennsylvania, Rhode

Island, South Carolina, Texas, Virginia, Washington Territory, and Wisconsin on from one to five days. In states and territories other than those named no solar halos were reported. They were reported in the greatest number of states and territories, eight, on the 23d; in seven, on the 13th; in from one to six, inclusive, on the 1st, 5th, 6th, 8th to 12th, inclusive, 14th to 22d, inclusive, and from the 24th to 31st, inclusive.

Lunar halos were most frequently reported in Louisiana and South Carolina, where they were noted on seven dates; in Alabama, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, Nevada, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, Wisconsin, and Wyoming on from one to five dates. In states and territories other than those named no lunar halos were reported. They were reported in the greatest number of states and territories, nine, on the 8th, and in from one to five, inclusive, on from the 1st to 7th, inclusive, 9th to 15th, inclusive, 18th, 22d, 23d, 27th to 31st, inclusive. For dates other than those named no lunar halos were reported.

#### METEORS.

The distribution of meteors by dates was as follows: 1st, Kalamazoo, Mich. 3d, Teviston, Ariz.; New Orleans, La. 5th, Louisville, Ill. 7th, Yellow Springs, Ohio. 9th, Chattanooga, Tenn. 10th, Charleston, S. C. 11th, Springfield, Ill.; Yellow Springs, Ohio. 12th, Springfield, Ill. 13th, Waverly, Ohio. 14th, New Orleans, La.; Dudley, Mass. 15th, Whipple Barracks (Prescott), Ariz.; Kissimmee, Fla.; Charleston, Ill.; Dudley, Mass.; Beverly, N. J. 16th, Wheatland, Cal.; Crowley, La.; Sault de Ste Marie, Mich.; Lewer's Ranch, Nev.; Riddleton, Tenn. 17th, Tenaflly, N. J.; Cedar Springs, S. C. 18th, Chicago, Ill.; Concordia, Kans.; Amherst, Mass.; Wedgewood, N. Y. 20th, Thornville, Mich.; Rolling Green, Minn.; Nashua, N. H.; Wilmington, N. C. 21st, Wedgewood, N. Y. 22d, Brownsville, Tex. 23d, Sault de Ste Marie, Mich.; Nashville, Tenn. 24th, Keeler, Cal. 25th, Villa City, Fla. 26th, Berkeley, Cal.; Kissimmee, Fla.; Thornville, Mich. 27th, Whipple Barracks, Ariz.; Little Rock, Ark. 28th and 29th, Mesquite, Tex. 30th, Kissimmee, Fla. 31st, Villa City, Fla.; Charleston, Ill.; Riddleton, Tenn.

Charleston, S. C.: a large meteor was observed in the north-western sky at 8.30 p. m., 10th. It was shooting down towards the horizon, with considerable rapidity, and burst when in about altitude 20°. Huge flakes of what appeared to be molten fire flew in different directions, and disappeared.—*The Daily Sun, Charleston, S. C., July 11.*

Springfield, Ill.: a very brilliant meteor was observed in the northern sky shortly after 11 p. m., 11th. As the meteor fell it resembled a large sky rocket descending to the earth, and while visible it changed colors several times.

Wheatland, Yuba Co., Cal.: a brilliant meteor was observed at 9.16 p. m., 16th. It consisted of a large pear-shaped ball of white light, followed closely by a smaller red one, falling slowly in a southeasterly direction at an angle of 45°. Immediately before disappearing the meteor burst like a rocket.—*Report of Mr. William Lumbard.*



Concordia, Kans., 18th: a bright meteor was observed passing from east to west at 10.15 p. m., leaving a streamer of pale white light 60° long in its wake.

Wilmington, N. C.: a brilliant meteor flashed across the sky from north to south at 11 p. m., 20th. The meteor left a silvery trail of light, like that of a sky-rocket, and when near the earth it burst into fragments and disappeared from view.

Nashville, Tenn.: a brilliant meteor was observed at 9.15 p. m., 23d, about 2° southeast of the zenith, and disappeared when about 10° above the southeastern horizon.

Whipple Barracks, Ariz.: a brilliant meteor was observed at 11 p. m., 27th, in azimuth 100° and altitude 75°; it travelled about 25° in a westerly direction and disappeared.

Little Rock, Ark.: a number of meteors were observed during the evening of the 27th, one of which was very bright, and was seen at 9.18 p. m., moving slowly from south to north, and having a bright orange-colored trail.

Charleston, Coles Co., Ill., 31st: a meteor was observed in the north, in altitude about 20°, at 8.40 p. m.; it shot across the sky in a southward direction, leaving a long white trail of light in its path. The meteor disappeared when about the same altitude in the south.—*Report of Mr. J. B. Dazey.*

#### MIRAGE.

Mirage were observed at Leech Farm, Dak., 30th, and at Traverse City, Mich., 31st.

#### SAND STORMS.

San Carlos, Ariz.: a severe sand storm occurred between 7.25 a. m. and 11.30 a. m., 3d. The sand and dust were so thick as to obstruct the view, objects six feet distant were not discernible, and the furniture in closed houses was covered by a layer of sand and dust one-eighth inch in depth. Sand storms have also been reported at Fort McDowell, Ariz., 11th, and at Wilcox, Ariz., 6th, 12th, 28th, 29th.

#### DROUGHT.

Winnemucca, Humboldt Co., Nev., 19th: reliable statements show that, in consequence of the prolonged drought, wheat sown last December yet remains in the ground plump and hard as when harrowed in. The ground was then dry, no rain having fallen for months, and it never has been moist enough since to sprout the grain. There are hundreds of acres sown to wheat and several acres sown to alfalfa, on the meadows, not one grain of which has sprouted, and the seed is apparently as sound as when it was sown. 30th: distressing accounts of loss of cattle from the scarcity of water along the Humboldt River continue to reach here. From Humboldt House, this county, west, the water holes in the Humboldt River bed are said to be lined with the decomposed carcasses of dead animals. The water in the sloughs and holes is impregnated with alkali, and when cattle, almost dying with thirst, reach there from the plains, they drink enough of poison-

ous water to kill them. A similar condition prevails on the Little Humboldt.—*The Silver State, Winnemucca, Nev., July 19th and 30th.*

Fresno, Cal., 31st: King's River, from where all the canals for irrigation in this section lead, is lower than it has been for seven years, and several of the large canals are closed. The water in this section is scarce.

Salt Lake City, Utah, 31st: the drought, which has prevailed during the entire month, continues. All vegetation in this section is withered, and the water is scarcely sufficient for household purposes.

Helena, Mont., 31st: the drought, which was already felt on the 30th of June last, has continued throughout this month, the amount of rainfall during the month being too small to be of any benefit. The crops in this section are completely ruined, some of them cannot even be cut for fodder, and the grass on the ranges has dried and blown away.

#### SUN SPOTS.

Mr. John W. James, Riley, McHenry Co., Ill.: none seen until the 12th, when the large spot reappeared; on meridian 18th, and disappeared by the solar rotation late on the 24th. From the 15th to the 21st two groups, very changeable, daily, of small spots were seen. 26th, small spots formed near the west edge; gone on the 28th. Still another new and changeable group formed near the east edge on the 30th and 31st, passing the sun's meridian August 2d. Mr. C. E. Buzzell, Leaf River, Ogle Co., Ill.: 13th, large spot appeared on the east limb by solar rotation, disappearing by solar rotation on the 24th. A new outbreak occurred just north of this spot while near the meridian on the 18th, subsiding on the 22d; this spot is a second period of the June 16th disturbance. 14th, small group newly formed near the meridian, disappearing on the 16th. 28th, a group of variable spots formed two days west of the meridian, disappearing in faculae on the 30th. 29th, a variable group observed, two days in, on east limb, increasing on the 31st. Mr. M. A. Veeder, Lyons, Wayne Co., N. Y.: 1st, an extended group of faculae was appearing by rotation, and continued active throughout its entire transit, being seen at the western limb on the 9th and 10th. This group returned also by rotation on the 26th, the small spots having formed meanwhile. On the 7th a group of faculae appeared by rotation, and continued active throughout its entire transit, spots forming in connection with it when near the meridian on the 15th, and disappearing by rotation on the 20th. On the 10th, 11th, and 12th, an extended group of faculae with a very large spot, seen also in June, came into view and persisted throughout the entire transit. On the 15th, faculae appeared by rotation, and persisted, becoming the seat of a group of small spots when near the western limb on the 26th, disappearing by rotation on the 28th.

### VERIFICATIONS.

#### FORECAST FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for July, 1889, were made by 1st Lieutenant Richard E. Thompson, 6th Infantry, Signal Officer and Assistant, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps.

#### Percentages of forecasts verified, July, 1889.

States.	States.
Maine..... 75.9	Eastern New York..... 76.7
New Hampshire..... 72.8	Western New York..... 82.6
Vermont..... 73.0	Eastern Pennsylvania..... 76.5
Massachusetts..... 77.7	Western Pennsylvania..... 84.1
Rhode Island..... 79.9	New Jersey..... 75.3
Connecticut..... 77.0	Delaware..... 69.9

#### Percentages of forecasts verified, July, 1889—Continued.

States.	States.
Maryland..... 68.1	Lower Michigan..... 74.0
District of Columbia..... 71.2	Upper Michigan..... 81.7
Virginia..... 71.5	Wisconsin..... 79.8
North Carolina..... 80.2	Minnesota..... 80.6
South Carolina..... 80.5	Iowa..... 78.9
Georgia..... 79.3	Kansas..... 83.4
Eastern Florida..... 84.1	Nebraska..... 80.2
Western Florida..... 78.6	Missouri..... 84.4
Alabama..... 78.4	Colorado..... 84.7
Mississippi..... 81.8	Dakota..... 85.2
Louisiana..... 84.0	Southern California*..... 93.7
Texas..... 89.2	Northern California*..... 90.0
Arkansas..... 80.1	Oregon*..... 87.7
Tennessee..... 82.1	Washington Territory*..... 87.8
Kentucky..... 83.5	By elements: Weather..... 83.8
Ohio..... 82.3	Temperature..... 72.8
West Virginia..... 85.0	Monthly percentage of weather and temperature combined†..... 79.4
Indiana..... 79.7	
Illinois..... 81.4	



\* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10. ‡ The forecasts of temperature in districts east of the Rocky Mountains for July, 1889, were, for the first time, made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day.

#### FORECAST FOR 48 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer authorized forecasts for forty-eight hours, covering the second day, in advance. Such forecasts were optional with the predicting officer and were only made when clearly in the public interest, and covered, in all cases, considerable areas of country, and were not confined to localities.

Percentage of verifications of forecasts made for second day in advance: Number of predictions made: weather, 19; temperature, 41. Percentages of verifications: weather, 67.1; temperature, 71.5. Weather and temperature combined, 68.9.

#### CAUTIONARY SIGNALS FOR JULY, 1889.

Statement showing percentages of justifications of wind signals for the month of July, 1889:

**Wind Signals.**—(Ordered by 1st Lieutenant R. E. Thompson.) Total number of signals ordered, twenty-three; justified as to velocity, wholly thirteen; justified as to direction, twenty-two. All of the signals ordered were cautionary. Eleven signals were ordered for easterly winds, of which ten were justified, and twelve were ordered for westerly winds, all of which were justified. Percentage of justifications, 46.6.

**Percentages of local verifications of weather and temperature signals as reported by directors of the various State Weather Services for July, 1889.**

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois.....	73.1	75.8	New Jersey.....	83.0	94.0
Indiana.....	78.0	85.0	New York.....	87.0	86.1
Kentucky.....	86.0	90.0	Ohio.....	79.0	87.0
Michigan.....	83.4	83.9	Pennsylvania.....	81.0	91.0
Minnesota.....	71.0	80.0	South Carolina.....	86.0	88.5
Nebraska.....	74.6	85.6			

### STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts are republished from reports for July, 1889, of the directors of the various state weather services:

#### ALABAMA.

The average temperature for the month has been nearly three degrees above the normal, and the month was marked by some very hot days, one station registering as high as 100 and several reporting as high as 98.

At some stations the precipitation has been greatly in excess of the normal, injuring the crops in those localities. The average for the state was 1.93 above the normal.

The seasons have been very good for the production of cotton and corn, and the indications for a good harvest are very flattering, though in some localities worms have made their appearance, and much complaint is made of the damaging effects of rust.

##### SUMMARY.

**Temperature.**—Monthly mean, 79.8; highest monthly mean, 86.4, at Columbiana; lowest monthly mean, 75.6, at Valley Head; maximum, 100, at Talladega, 24th; minimum, 62, at New Market and Valley Head, 6th, 9th; range for state, 38; greatest local monthly range, 33, at Montgomery, Talladega, and Valley Head; least local monthly range, 21, at Guntersville and Greensborough. **Precipitation.**—Average for the state, 6.01; greatest, 9.55, at Mobile; least, 1.65, at Talladega. **Wind.**—Prevailing direction, southwest.—P. H. Mell, Signal Corps, Auburn, director.

#### ARKANSAS.

##### SUMMARY.

**Temperature.**—Monthly mean for the state, 80.3; highest monthly mean, 82.5, at Lead Hill; lowest monthly mean, 76.4, at Ozone; maximum, 107, at Lead Hill, 18th; minimum, 53, at Eureka Springs, 30th and 31st; range for state, 54; greatest local monthly range, 49, at Lead Hill; least local monthly range, 19, at Conway.

**Precipitation.**—Average for the state, 5.04; greatest monthly, 12.00, at Russellville; least monthly, 2.10, at Heber.—Prof. John C. Branner, Little Rock, director; W. U. Simons, Sergeant, Signal Corps, assistant.

#### COLORADO.

##### SUMMARY.

**Temperature.**—Monthly mean, 66; highest monthly mean, 77.3, at Cañon City; lowest monthly mean, 54.9, at Climax; maximum, 107, at Julesburg, 6th; minimum, 25, at Breckenridge, 3d; range for state, 82.

**Precipitation.**—Average for the state, 1.64; greatest monthly, 3.52, at Julesburg; least monthly, 0.10, at Gunnison.—Prof. F. H. Loud, Colorado Springs, director; T. W. Sherwood, Sergeant, Signal Corps, assistant.

#### DAKOTA.

##### SUMMARY.

**Temperature.**—Monthly mean, 70; highest monthly mean, 73, at Yankton; lowest monthly mean, 53, at Wahpeton; maximum, 106, at Valentine, Nebr., 5th and 6th, and Roscoe, 6th; minimum, 37, at Brookings, 4th, and at New England City, 8th; range for state, 69.

**Precipitation.**—Average for the state, 3.13; greatest monthly, 7.07, at Webster; least monthly, 0.63, at Fort Buford; greatest daily, 2.89, at Webster, 11th. **Wind.**—Prevailing direction, southeast.—S. W. Glenn, Sergeant, Signal Corps, Huron, in charge.

#### ILLINOIS.

##### SUMMARY.

**Temperature.**—Monthly mean, 74.1; maximum, 102, at McLeansborough, 12th; minimum, 49, at South Evanston, 16th; range for state, 53.

**Precipitation.**—Average for the state, 4.70.

**Wind.**—Prevailing direction, southeast.—John Craig, Sergeant, Signal Corps, Springfield, in charge.

#### INDIANA.

July, 1889, was a wet as well as a cool month. Rains fell quite frequently and at many stations in large quantities during a few hours. Everywhere, in comparison with the normals, the amounts measured were greatly in excess, ranging from 0.67 to 5.56, except at Farmland, where the amount was slightly deficient, 0.15, showing that the rainfall was probably badly distributed. The greatest excess occurred in the southern portion, 2.81; in the northern portion the excess was 2.04; and the least excess occurred in the central portion. The excess for the state over a normal of seven years was 1.85. The rains were frequently accompanied by lightning and thunder, and by hail on the 24th and 26th at Butlerville, and on the 26th at Cannelton, Worthington, Crawfordsville, and other neighboring places; that at Crawfordsville was exceedingly large, nearly as large as hen's eggs, and the track of the storm was about a mile wide. Much damage was done to crops and trees. Some of these storms were accompanied by exceedingly strong winds for a short time.

##### SUMMARY.

**Temperature.**—Monthly mean, 73.9; highest monthly mean, 77.3, at Huntingburgh, lowest monthly mean, 7.02, at Columbia City; maximum, 97, at Angola, 2d and 10th; minimum, 50, at Delphi and Columbia City, 5th; range for state, 37; greatest local monthly range, 45, at Mauzy; least local monthly range, 21, at Butlerville. **Precipitation.**—Average for the state, 5.41; greatest, 10.50, at Marengo; least, 3.10, at Marion.

**Wind.**—Prevailing direction, southwest.—Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.

#### IOWA.

July, 1889, averaged nearly normal in temperature, rainfall, and cloudiness; southerly winds and calms prevailing; it was, therefore, mainly a favorable month for crops.

The mean temperature of the air was but very little above normal. The first two decades were decidedly warm, being 2 above normal; the last decade was markedly cool, being over 3 below normal. Nine of the ten hot days of the month fell in the first two decades; and the 1st, 8th, and 18th were the hottest of these. The last two days were the coldest, being 10 below normal, that is, corresponding to the normal temperature of middle September.

The mean cloudiness was less than normal, and while we had 13 clear days there was only 1 cloudy day during July.

The total rainfall during July averaged about normal for the entire state. At the central station it exceeded normal by 14 per cent. Along the Mississippi, from Lee to Jackson counties, the rainfall exceeded 4.00, nearly reaching or exceeding 7.00 at Denmark, Muscatine, and Clinton. A broad belt extending eastward from Harrison and Page to Johnson and Linn counties, also received over 4.00 of rainfall, reaching 7.00 locally in Jasper county. The northwest, as far as Kossuth and Harrison counties, generally received over 5.00, exceeding 7.00 in Monona and Sac counties.

The total rainfall was least in the north and northeast, from Concord to McGregor, and from Mitchell county to Buchanan county; throughout this territory, amounting to nearly one-eighth of the state, the rainfall was insufficient, being less than 2.00. From Concord over Butler to Bremer county the rainfall was even less than 1.00. The territory of Iowa not above specified received sufficient rainfall, from 2.00 to 4.00.

The greatest rainfall occurred on the 2d in the southeast, on the 8th and 9th in the north, on the 13th and 14th from Audubon and Adams counties east to the Mississippi, on the 17th in the extreme southeast, on the 25th in the northeast. The highest single rainfalls reported are nearly 5.00 in Monona county



on the 8th, in Sac county on the 13th, and in Lee county on the 16th.—*Dr. Gustavus Hinrichs, Iowa City, director.*

#### IOWA WEATHER CROP BULLETIN SERVICE.

The past month has been unusually favorable for growing crops and for harvesting. The early part of the month, with the exception of the 3d, 4th, and 5th, was remarkable for its high temperature, no general but many local and severe rain storms. The middle of the month brought general rains with continued high temperature. Scott county reported the heaviest single rainfall, 5.14 inches having fallen at Davenport on the 14th during four hours. The last part of the month was characterized by a decided deficiency both in precipitation and in temperature. Severe hail storms occurred on the 28th in the counties of Cerro Gordo and Hamilton, doing considerable damage to corn. Light frosts, doing no damage, were reported from Adair county on three mornings of the last week. With the dry weather came an abundance of sunshine, which afforded a most favorable opportunity for haying and harvesting. The hay crop has been above the average, and most of it was gathered in good condition. Oats, wheat, and other small grain gave an exceptionally large yield.

#### SUMMARY.

**Temperature.**—Monthly mean, 73.8; highest monthly mean, 79.1, at Washington; lowest monthly mean, 69.5, at Hampton; maximum, 102, at Blakeville and Jefferson, 18th; minimum, 46, at Hampton, 30th, Bancroft, and Amana, 31st; mean maximum, 94.4; mean minimum, 52.6; greatest local monthly range, 50, at Glenwood, McGregor, and Jefferson; least local monthly range, 32, at Independence; range for the state, 56; mean monthly range, 41.8.

**Precipitation.**—Average for the state, 4.22; greatest, 8.50, at Glenwood; least, 1.19, at Washington.

**Wind.**—Prevailing direction, south.—*G. M. Chappel, Sergeant, Signal Corps, Des Moines, in charge, Iowa Weather Crop Bulletin Service.*

#### KANSAS.

The month was characterized by three hot waves, and three wet or rain-waves. The former spread over the western division, and extended into the middle, but failed to reach the eastern; while the latter were felt mainly in the eastern and middle, affecting the western division principally in its extreme northern and southern counties. The wet weather has seriously interfered with the proper handling of wheat and oats, but, as a compensation, gives a spring-like appearance to all vegetation, and has increased the yield of corn, potatoes, and hay, and given a fine prospect for fruit.

#### SUMMARY.

**Temperature.**—The temperature is deficient in the eastern and the larger part of the middle division. This deficiency is greatest in the northeastern and gradually diminishes as it proceeds south and west; in the extreme northeast it amounts to about 3, in Leavenworth to 2.5, in Douglas to 2, in Shawnee to 2.3, in Woodson to 1.3, in Montgomery it has disappeared, the mean being normal. A slight excess in Labette and Cherokee, while the deficiency extends to the west of Montgomery, amounting to 2.4 in Chautauqua, but diminishes in Cowley, and is only 0.6 in Sumner. West of Sumner it gradually changes, being slightly in excess in the central counties of the western division. In the northern counties the deficiency continues to the west line of the state. Hot waves occurred on the 5th and 6th, 16th and 17th, and 26th and 27th. The second one was the most extensive. There was an increasing temperature during the first half of the month, culminating in the second hot wave, since which it has been diminishing. The average temperature of the middle division is 5 in excess of that in the western, and 1.3 in excess of the average of the eastern.

**Precipitation.**—The average rainfall for the state, is 4.65. In the western division it is 2.77, in the middle 4.97, and in the eastern 6.20. In the eastern tier of counties, south of Atchison, the rainfall is deficient, amounting to 1.78 in Leavenworth and 1.64 in Bourbon, being nearly uniform. It changes to an excess in the next counties west, being about 0.40 excess in Franklin, 1.99 in Douglas, 4.15 in Shawnee, 4.11 in Cloud, 1.67 in Woodson, 3.18 in Montgomery, 4.70 in Chautauqua from whence it diminishes west, being 4 in Sumner, about 0.50 in southeast part of Ford, while in the central and northwest part of Ford there is a deficiency of 1.48, which increased to the Colorado line. Three rain-waves crossed the state this month; the first occurring on the 8th and 9th, the second on the 13th and 14th, and the third extending from the 18th in the western division to the 25th in the eastern, both dates inclusive. It was during this last rain-wave that nearly all of the excessive rains occurred. Entering the state in Doniphan the rainfall for the month is about 4. This rapidly increases towards the southwest, being 8.62 in the northeast part of Pottawatomie and reaching 10.00 in Riley; after which it diminishes, being 5.05 in Dickinson, 3.65 in McPherson, and 2.99 in Harvey, whence it rapidly increases to 7.00 in the southwest part of Reno, which amount extends southeast through Sumner, and appears again in Chautauqua and Montgomery. From Reno the rainfall diminishes to Comanche, in the western part of which it is 2.35, but now rapidly increases to 7.59 in the southwest part of Clark, but rapidly diminishes again west of Meade. The 10.00 rainfall in Riley falls to 8.11 in Shawnee, 7.73 in Coffey, and 6.00 in Woodson. Northwestward it falls to 8.29 in Cloud, and increases thence to 11.75 in the northwestern part of Jewell, after which it diminishes towards Colorado, being 6.00 in Decatur, and 5.50 in Rawlins. From the north the monthly rainfall rapidly diminishes towards Ellis and Trego, but slowly diminishes from Trego to the west line of the state. There is a slight increase in Lane and Ness, otherwise the diminution from Barton west is tolerably uniform.

**Wind.**—Prevailing direction, south.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

#### KENTUCKY.

##### SUMMARY.

**Temperature.**—The mean temperature of the state for the month, as deduced from the tri-daily observations, was 75.1; from the average of the mean maximum and minimum temperatures, 76.4. These figures show the temperature of the month to have been about 2.0 less than the normal. The highest recorded was 98, at Richmond, 7th, and the lowest 50, at Pellville, 16th. The average monthly range of temperature was 32.9; the greatest 43°, at Pellville, and the least 21, at Franklin. The average warmest day of the month was the 9th, and the average coolest the 4th. The temperature was remarkably uniform throughout the month, and the periods of excessive heat were very few and of short duration.

**Precipitation.**—The average rainfall for the month was 5.62, which is about 1.00 in excess of the normal. The largest monthly rainfall, 8.75, occurred at Bowling Green, and the smallest, 2.86, at Ashland. The precipitation was very unevenly distributed throughout the state, the southern and western portions reporting a large excess, while in the northern and eastern portions a considerable deficiency exists. At Louisville on July 31st the rainfall for the year since January 1st was 8.91 less than the normal amount. Excessive rains fell in most parts of the state on the 28th. The average number of rainy days for the month was 10; cloudy, 12; partly cloudy, 10; and clear, 11.

**Wind.**—Prevailing direction, southwest.—*Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.*

#### LOUISIANA.

There was quite a heated spell from the 14th to the 23d during which the maximum temperature was generally between 90 and 98 at the majority of stations. The minimum temperatures of the month occurred on the 28th to 31st in all sections of the state. The average temperature of the month for the state was within a few tenths of a degree of the normal for the month, and the rainfall was slightly in excess as compared with the normal for the state. The excess of rain in the northern section of the state was 1.50, and in the southern section less than 0.20.

##### SUMMARY.

**Temperature.**—Monthly mean, 82.1; highest monthly mean, 84.3, at Winnfield; lowest monthly mean, 78.2, at Amite; maximum, 102, at Cameron, 21st; minimum, 53, at Convent, 31st; range for the state, 49; greatest local monthly range, 44, at Clinton; least, 19, at Shell Beach; mean daily range, 18.8.

**Precipitation.**—Average for the state, 5.82; for the northern section, 5.50; southern section, 6.04; greatest local monthly rainfall, 10.49, at Houma; least, 2.13, at Minden; greatest daily rainfall, 4.07, at Monroe, 22d.

**Wind.**—Prevailing direction, southwest.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

#### MICHIGAN.

The temperature for the month has been below the normal in all sections. The rainfall for the state has been below the normal. The remarkable features were the heavy rainfalls of the 18th in the southwest portion, and of the 27th in the central portion.

##### SUMMARY.

**Temperature.**—The mean temperature for the month, 68.5, is 2.7 below the normal of fourteen years. The temperature was below the normal in all sections. The highest mean temperature, 76, occurred on the 9th, when the temperature was 3 below the normal, and the lowest, 62, on the 14th, 15th, and 31st, when it was 9, 11, and 10, respectively, below the normal. The highest mean daily temperature in the past fourteen Julys, 85, occurred on the 17th, 1878, and the lowest, 60, on the 4th, 1882; the highest monthly mean, 74.3, occurred in 1876-'78, and the lowest, 66.7, in 1884. The maximum, 102, occurred at Lathrop, 7th, and the minimum, 33, at Evart, 24th. Light frost was reported in northern portion on 24-25th, but no damage was reported.

**Precipitation.**—The average rainfall for the month, 2.65, is 0.67 below the average of fourteen years. The rainfall was above the average in the upper peninsula, and generally below the average in the southern. The counties of Gratiot and Montcalm in the central section, and Allegan, Berrien, Calhoun, Branch, Hillsdale, Kalamazoo, Lenawee, Saint Joseph, and Van Buren in the southern section, had rainfalls above the average, also the counties of Benzie, Crawford, and Grand Traverse in the northern section, while the remaining portion of the state received a rainfall of less than the average amount. The heavy rainfall of the 18th, in the southwest portion of the southern section, was remarkable for the amount of rain that fell in so short a period, the storm lasting only about six hours, and in some places ten hours, and the rainfall recorded by the gauges was from 3.00 to 5.00. The largest amount recorded by any one station was 4.90 at Sturgis, and the next largest amount was 4.59 at Colon, both stations in Saint Joseph county, and within a few miles of each other. The largest amount of rainfall recorded for the month, 6.83, occurred at Colon, and the least, 0.69, at Port Huron. The heaviest rainfall in the past fourteen Julys, 5.68, occurred in 1883, and the least, 1.40, in 1886.

**Wind.**—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

#### MINNESOTA.

The temperature over the state was quite uniform and differed but slightly from the normal, the variation being but 1.0, which was a deficiency. The



average precipitation, 2.93, is about 25 per cent. less than the July normal. Geographically the rainfall was not evenly distributed. There was more than 40 per cent. of an excess in the vicinity of Lake Superior; the counties south of the centre of the state and between the Mississippi and Minnesota rivers received about the usual amount for July; in other portions of the state the precipitation was deficient, notably so in the northwest, near the Red River, where the deposit was deficient about 60 per cent.

## SUMMARY.

**Temperature.**—Monthly mean, 69.5; highest monthly mean, 72.7, at Pine River Dam; lowest monthly mean, 63.0, at Pokegama Falls; maximum, 100, at Farmington, 7th; minimum, 36.0, at Pokegama Falls, 30th; range for state, 64.0; greatest local monthly range, 54.0, at Pokegama Falls and Moorhead; least local monthly range, 34.0, at Duluth; greatest daily range, 45.0, at Saint Vincent, 10th; least daily range, 4.0, at Duluth, 9th, 19th, and 25th.

**Precipitation.**—Average for the state, 2.93; greatest, 5.53, at Duluth; least, 1.23, at Saint Vincent.

**Wind.**—Prevailing direction, south.—*John Healy, Private, Signal Corps, Saint Paul, in charge.*

## MISSISSIPPI.

## SUMMARY.

**Temperature.**—The month showed but slight variations in mean daily temperature. The normal mean monthly temperature for the state in July is 81.3, and for this July it was 81. The month began with a mean temperature of 80, over the state. This fell to about 75 on the 6th, rose to 80 about the 10th, and continued above 80 until the 27th, when it fell again, reaching the lowest mean temperature of the month, about 73, on the 31st. The daily range was never very great, its values falling generally between 10 and 20. The greatest monthly range was at Columbus, from 104 on the 19th, to 60 on the 6th. The extremes in the state were 104 at Columbus, 19th, and at Meridian, 20th and 24th, and 54 at Holly Springs, 31st. Columbus had the highest monthly mean, 84.4, and Corinth the lowest, 77.2. The temperature during the month was very favorable to the growth of cotton.

**Precipitation.**—The average number of days on which rain fell was twelve, the actual number of rainy days varying from four at Hernando, to twenty-two at Summit. The average rainfall was 5.42, being 1.58 more than the normal for July. The deficiency since January 1st, has by this excess been reduced to 7.83. The heaviest rains in twenty-four hours were at Natchez, 2.00, 25th; Summit, 2.31, 30th; Waynesborough, 2.00, 7th; Rienzi, 2.79, 14th; Louisville, 2.15, 30th; and an unmeasured fall in the vicinity of Winona on the 30th, which must have exceeded 3.00. Electrical excitement was shown at almost every rainfall. It was very marked in the general rain and wind storm of the 28th and following days. During this storm the wind was northerly and cool. A very destructive cloud-burst or local rainfall occurred on the 30th in Montgomery and adjoining counties, over an area about thirty miles square.—*R. B. Fulton, Signal Corps, University, director.*

## MISSOURI.

## SUMMARY.

**Temperature.**—The mean temperature for July was 76.7. The highest temperature reported was 107, at Protem, and the lowest, 46, at Ozark. The average of maximum temperatures was 82.8, and the average of minimum temperatures 57.2, making an average range of 25.6. The highest temperatures occurred on the 7th, 13th, 17th, 18th to 22d, and 27th, and the lowest on 30th and 31st.

**Precipitation.**—The average precipitation, 2.93, was 0.11 below the July normal. The greatest amount of precipitation reported was, 6.78, at Keokuk, Iowa, and, 6.65, at Ironton, and the least, 1.02, at Sedalia. In the state as a whole precipitation occurred on 24 days. The greatest number of days of precipitation in any one place was 16 days at Cairo, Ill., and the least, 4 days, at Carthage.—*Prof. Francis E. Nipher, Saint Louis, director.*

## NEBRASKA.

The month has been, both in temperature and rainfall, a month of extremes. The temperature has never risen so high nor fallen so low, nor has there been so large a rainfall in July since the organization of the service; the maximum temperature has not been exceeded in any month and the rainfall only in the month of June, 1883.

## SUMMARY.

**Temperature.**—The mean temperature has been 2.0 below the normal, but there passed over the state on the 6th and 7th a hot wave, bringing the highest temperatures on record, reaching 111 at Mullen and nearly as high throughout the western part of the state generally, but diminishing as the wave moved eastward, giving temperatures of from 92 to 100 in the eastern part of the state. The minimum for the month was 38, at Kimball, which is exceedingly low for July.

**Precipitation.**—Excepting in the western portion of the state the rainfall has been excessive. The normal rainfall for July is 4.40. The rainfall during the present month has ranged from 1.29 at Bingham to 13.20 at Minden. The whole central portion of the state has been deluged with rain, rendering harvesting difficult and spoiling considerable grain.—*Prof. Goodwin D. Sweeney, Crete, director; G. A. Loveland, Corporal, Signal Corps, assistant.*

## NEVADA.

## SUMMARY.

**Temperature.**—The weather during the past month has been unusually warm

in all sections of the state; there was a very large percentage of sunshine, each station having an average of a little over twenty-four clear days. During the last few days of the month smoky and hazy weather prevailed to a considerable extent all over the state. Two well defined warm-waves passed over the state, the first from the 30th of June to the 5th, and the second, which was by far the most intense, from the 27th to the 30th. Nearly all of the highest temperatures reported occurred on the 29th. The mean temperature for the state, 76.1, is only 0.5 higher than the average, but the number of stations which reported maximum temperatures above 100 this month is far greater than that reported during the same month last year. The temperature ranged from 119 at El Dorado Canyon, 27th, to 36 at Elko, 16th; range for state, 83.0.

**Precipitation.**—There were no general and but very few thunder and hail-storms during the month. The rainfall, which was very small and much below the average, was very unevenly distributed, and fell chiefly in the southwestern part of Elko county, central portion of Esmeralda county, and in Lincoln county. The total absence of rain in the remainder of the state has greatly injured crops of all descriptions. Farmers are complaining of lack of water in streams and springs, and predict a hard time for themselves and the cattlemen. Cattle all over the state are suffering from this disastrous drought. Of twenty-nine reporting stations this month only five reported rain, while during the same period last year rain fell at nineteen out of a total of thirty-three stations, and was well distributed.—*Prof. Chas. W. Friend, Carson City, director; H. F. Alcimore, Private, Signal Corps, assistant.*

## NEW ENGLAND METEOROLOGICAL SOCIETY.

## SUMMARY.

**Temperature.**—Monthly mean, 68.4 (107 stations); highest monthly mean, 72.8, at Olneyville; lowest monthly mean, 60.7, at Eastport; maximum, 97, Berlin Falls, 1st; minimum, 33, at Berlin Falls, 16th; range for New England, 64; greatest local monthly range, 64, at Berlin Falls; least local monthly range, 22, at Nantucket; greatest daily range, 50, at Berlin Falls, 6th; least daily range, 0, at Groton, 15th. The average temperature for July for 25 stations, having records for more than 10 years, is 70.3; the average for July, 1889, is 68.5, departure -1.8.

**Precipitation.**—Average for New England, 7.61 (137 stations); greatest, 17.08, at New Haven; least, 1.72, at Sorrento. The average precipitation for July for 34 stations, having records for more than 10 years, is 4.00; the average for July, 1889, is 7.99; departure, +3.99.

**Wind.**—Prevailing direction, southwest (23 stations).—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; L. G. Schultz, Sergeant, Signal Corps, assistant.*

## NEW JERSEY.

## SUMMARY.

**Temperature.**—The mean temperature, 73.4, is 1.1 below the average for the month, and 2.3 above the average for the corresponding month of 1888. The highest temperature recorded was 96, and the lowest, 48, as against 99 and 45, respectively, during July, 1888. The highest temperatures were generally recorded on the 8th, 9th, 10th, and 14th, and the lowest on the 15th, 16th, 18th, and 24th.

**Precipitation.**—The average for the state, 10.19, is 5.87 above the average for the month, and is 6.79 above the average for the corresponding month of 1888. The rainfall was very unevenly distributed. The fierce downpour on the 30th and 31st did considerable damage, especially in the vicinity of Plainfield and the Oranges. At Plainfield three dams gave way and the entire town was flooded. Several large ice houses were destroyed and some of the finest residences were damaged. All the Oranges were flooded and many houses were damaged or destroyed. Fritz's dam was swept away, and the waters almost completely wrecked Epples Park. The tracks of the Erie Railroad were badly undermined and all traffic was stopped. In East Orange many elegant residences were in an open sea, fences, roads, and all landmarks having disappeared. The low meadows along the Passaic River and its branches were flooded, destroying thousands of acres of hay. This crop is estimated at \$5.00 per acre, which shows a loss of from \$60,000 to \$65,000. The most remarkable features of the month were that the thunder-storms were generally distant, with almost a total absence of high winds. The rainfall at South Orange, 18.58, is phenomenal, and the wonder is that the damage is not greater than it was. Five stations report a total for the month exceeding 14.00, three exceeding 12.00, and ten 10.00. The excess (above the average) at all stations is from 0.34 on the Atlantic coast to 14.26 at South Orange.

**Wind.**—Prevailing direction, southwest.—*Prof. George H. Cook, New Brunswick, director; E. W. McGann, Sergeant, Signal Corps, assistant.*

## NEW YORK.

## SUMMARY.

**Temperature.**—The highest temperature, 100, at Utica, 9th, and the lowest, 34, at Middleburgh, 14th; mean temperature for the state, 69.8. The greatest local monthly range of temperature was 57, at Middleburgh, and the least was 23, at Erie, Pa. The temperature was generally below the normal, excepting at Central Park, New York City, where it was 1.9; Factoryville, 0.2; Humphrey, 1.5; Potsdam, 1.8; Palermo, 1.0; Palmyra, 1.2; Rondout, 1.6; and Utica, 1.0 above.

**Precipitation.**—Average for the state 3.88. The rainfall was generally above the average, excepting at Erie, Pa., where it was 1.30; Humphrey, 0.75;



Rochester, 0.07; and Oswego, 0.20 below. The greatest monthly rainfall was 14.07, at White Plains; and the least was 1.68, at Erie, Pa. Average number of days on which rain fell, 13.

Wind.—Prevailing direction, west.—Prof. E. A. Fuytes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.

## OHIO.

## SUMMARY.

Temperature.—The mean temperature of the northern section was 71.5; of the middle section, 72.5; of the southern section, 74.1, and of the state, 72.7. These means are 0.4, 0.7, 0.7, and 0.6 below the average for the sections and state for July; maximum, 98, at Wapakoneta, 9th; minimum, 46.5, at Wauseon, 25th. This is the highest minimum on record for the month of July since the opening of the bureau. The mean daily range of temperature was 20.3. The greatest daily range was 40, at Wapakoneta, 9th, and the smallest, 5, at Hanging Rock, 24th.

Precipitation.—Precipitation was general and heavy in all sections on the 2d, 3d, 13th, 14th, 15th, 18th, 19th, 28th, and 29th; in the northern section on the 1st and 10th, and in the southern section on the 11th, 24th, and 26th. Local rains occurred in all sections on the 4th, 22d, and 31st; in the northern section on the 30th, and in the middle and southern sections on the 1st, 10th, and 20th. The following unusually heavy rainfalls were reported: 1.15 in one-half hour, at Dayton, 14th; 1.14 in one and one-half hour, at Greenville, 14th; 2.00 in forty-five minutes, at Pomeroy, 30th; 1.87 in one and one-half hour, 13th, and 3.50 in two hours, 18th, at Canton, and 5.50 in three and one-half hours, 18th, at Logan. A severe local storm occurred at Princeton, Butler Co., on the evening of the 18th. The mean rainfall in the northern section was 3.34, which is 0.02 below the average; 4.24 in the middle section, and 5.18 in the southern section. These means are 0.53 and 1.53 above the averages for these sections for July. The mean for the state, 4.25, is 0.68 above the average. The deficiency in rainfall to August 1st amounts to 1.14 in the northern section; 4.29 in the middle section, and 4.97 in the southern section. The average deficiency for the state is 3.46.

Wind.—Prevailing direction, southwest.—Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Corporal, Signal Corps, assistant.

## PENNSYLVANIA.

## SUMMARY.

Temperature.—The mean temperature was 71.2, which is about 1.0 below the normal, and 2.0 above the corresponding month of last year. The greatest departures were in the eastern border counties. The mean of the maximum temperatures was 81.3, and the mean of the minimum 61.8. The highest temperatures reported were Charlesville, 96; Hollidaysburgh and Greenville, 95; Philipsburgh, Coatsville, Grampian Hills, Bethlehem, New Bloomfield, and Philadelphia, 94. These occurred on the 9th and 10th. The lowest temperatures were Coudersport, 39; New Bloomfield, 40; Wellsborough, Columbus, and Dyberry, 42.

Precipitation.—The rainfall averaged 6.80 for the state, which is an excess of from 2.00 to 3.00. The month was very humid and tropical in character. Rains were frequent, and varied from light to torrential over areas little distant from each other. In many places heavy downpours occurred, which were disastrous, and entirely local in character. On the 30th and 31st very heavy rains occurred over the eastern part of the state, which caused heavy floods. The Schuylkill was reported the highest since the flood of 1869. Its banks were overflowed, and it is estimated that at one time ten feet of water were over Fairmount dam. The largest totals for the month were: Lansdale, 15.02; Ottsville, 13.19; Coatsville, 12.93; Frederick, 12.69; Pottstown, 12.50; West Chester, 12.49; Smith's Corner, 12.30; Point Pleasant, 12.30. The smallest were Greenville, 1.04; Erie, 1.68, and Columbus, 2.00. The excess of rainfall extended into New Jersey, Eastern New York, and Connecticut; also, Delaware and Maryland.

Wind.—Prevailing direction, west.—Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant.

## SOUTH CAROLINA.

## SUMMARY.

Temperature.—The mean temperature for the month, 79.5, is 0.6 above the normal for the last three years; highest monthly mean, 82.6, at Jacksonborough; lowest monthly mean, 75.8, at Camden; maximum, 102, at Greenwood, 11th; minimum, 51, at Cedar Springs, 6th; range for state, 51. In most instances the maximum temperature occurred on the 11th, and the minimum on the 8th.

Precipitation.—The average rainfall for the state, 7.13, is 1.03 above the normal of the last three years; greatest monthly, 10.8, at Cheraw; least monthly, 2.70, at Timmonsville; greatest daily, 3.38, at Columbia, 30th. Average number of rainy days, 13.2.

Wind.—Prevailing direction, southwest.—Hon. A. P. Butler, Columbia, director; H. C. Seymour, Private, Signal Corps, assistant.

## TENNESSEE.

## SUMMARY.

Temperature.—The mean temperature, 76.8, is very nearly the normal for the past seven years; highest local monthly mean, 81.7, at Woodstock; lowest local monthly mean, 70.3, at Fostoria; maximum, 97, on the 22d, at Watkins, and on the 24th at Hohenwald; this was the lowest July maximum recorded during the past seven years, except that of 1876, which was the same;

the highest being 102, last year; minimum, 56, at Hohenwald, 31st; this, together with the July minimums of 1883 and 1887, is the highest during the period named, and was 10 above the average for that period. The highest temperature was recorded generally on the 10th, 11th, and 24th in the eastern division, and on the 10th, 18th, 23d, and 24th in the other two divisions. The lowest temperature was generally recorded on the 5th. The daily ranges of temperature were less than the normal.

Precipitation.—The average precipitation for the state, 5.33, is 1.29 above the July mean of the past seven years, and is the greatest July average during that period, except in 1884, when it was 5.55. Of this amount the eastern division received an average of a little more than 5.00, the middle division about 6.00, and the western division nearly 4.50. The rains fell in various parts of the state on twenty-eight days, only three days, the 5th, 6th, and 8th, being reported without measurable rain. There were about sixteen days of general rains. The days of the greatest rainfall were the 11th to 14th, 25th, 26th, and 28th. The rains were generally well distributed, although some very heavy local falls were reported. The greatest local daily rainfall occurred at Lawrenceburg, where 7.58 fell from 9 a. m., 12th, to 1 p. m., 13th, twenty-eight hours. The greatest local monthly rainfall was 9.04, at Fostoria, and 9.02, at Ashwood. This amount has been exceeded only once during the past seven years, in July, 1884, when 10.62 fell at Manchester. The least local monthly rainfall was 1.66, at Watkins. Most of the rains during the month were accompanied by electrical disturbances, which in some instances were quite severe, and some of them with high winds, notably on the 14th, 15th, 20th, 24th, and 28th. The storm on the last named date was the most severe and the most widespread during the month, and did immense damage to the growing crops, fencing, and timber, and in some localities, where it assumed almost the character of a tornado, houses were blown down or unroofed.

Wind.—Prevailing direction, southwest.—J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.

## TEXAS.

## SUMMARY.

Temperature.—The mean temperature for the month was from 2 to 3 above the normal over that portion of the state north of the thirtieth parallel and east of the ninety-eighth meridian (west from Greenwich), over the eastern portion of the Panhandle and the extreme western part of the state. Over the other portions of the state, except at Galveston and Brownsville, where the normal prevailed, the temperature ranged from 2 to 6 below the normal. The greatest deficiency occurred at Silver Falls, where the mean temperature for the month was 6 below the normal, and the greatest excess at Dallas, where the mean for the month was 3 above the normal. The mean temperature for July over the state was 80. The highest temperature reported was 108, from Fort Elliott on the 27th, and the lowest, 50, from Hartley on the 23d.

Precipitation.—The rainfall for July was very unevenly distributed, and was from 1.00 to 3.00 below the 18 year normals for the month, except over Dallas, Tarrant, and Johnson counties, where there was an excess ranging from 4.00 to 6.00. The rainfall along the coast was less than 1.00, except between Columbia and Port Lavaca, where from 1.00 to 4.00 fell.—D. D. Bryan, Galveston, director; I. M. Cline, Sergeant, Signal Corps, assistant.

Meteorological record of Army post surgeons, voluntary, and other co-operating observers, July, 1889.

Stations.	Temperature. (Fahrenheit.)			Precip'n.		Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean				Max.	Min.	Mean	
<i>Alabama.</i>	°	°	°	<i>Ins.</i>		<i>Arizona—Cont'd.</i>	°	°	°	<i>Ins.</i>
Bermuda f.....	94	70*	76.9	4.07		Benson*.....	102	75	87.5	2.16
Butler f.....	93	68	80.9	6.75		Casa Grande*.....	116	78	93.0	0.00?
Citronelle f.....	99	68	82.1	8.34		Cedar Springs.....	.....	.....	.....	2.60
Columbiana f.....	96	65	78.0	5.03		Curtis*.....	.....	69	77.0	2.53
Decatur (1) f.....	.....	.....	.....	12.63		Fairbank.....	.....	.....	.....	5.19
Decatur (2) f.....	98	64	80.0	10.63		Flagstaff.....	102	40	68.6	5.00
Elkmont f.....	94	66	77.8	8.51		Florence.....	111	66	89.8	.....
Eufaula f.....	96	68	80.0	6.24		Fort Apache.....	102	55	76.2	2.68
Evergreen f.....	99	68	82.0	4.00		Fort Bowie.....	101	62	79.1	2.48
Fayette C. H. f.....	91	63	78.0	8.10		Fort Huachuca.....	96	55	76.0	3.66
Fort Deposit f.....	98	69	81.8	7.22		Fort Lowell.....	111	63	86.6	3.36
Greensborough f.....	93	72	81.7	4.52		Fort McDowell.....	117	67	92.0	0.64
Guntersville f.....	89	68	78.0	2.69		Fort Mojave.....	120	72	94.9	T.
Livingston (1) f.....	94	68	79.5	6.80		Fort Verde.....	110	57	82.6	3.40
Livingston (2) f.....	94	66	79.4	6.27		Gila Bend*.....	112	84	95.1	0.36
Luverne f.....	98	70	82.7	5.19		Globe.....	102	.....	.....	1.36
Marion f.....	94	62	77.4	7.84		Holbrook*.....	100	58	77.3	2.06
Metest f.....	92*	62	79.4	8.66		Lochiel g.....	100	68	84.0	3.77
Mount Willing f.....	94	70	79.5	8.45		Maricopa*.....	115	80	93.7	0.55
Mt. Vernon B'ks.....	100	65	81.0	7.91		Pantano*.....	111	70	86.6	3.22
New Market f.....	88	59	75.7	8.54		San Carlos.....	111	64	85.8	1.67
Opelika f.....	100	66	81.0	4.63		San Simon*.....	110	70	81.8	.....
Pine Apple f.....	100	66	81.4	0.19?		Signal.....	114	68	93.0	T.
Selma (2) f.....	98	67	82.6	4.80		Strawberry.....	.....	.....	.....	2.10
Talladega f.....	100	67	82.5	1.65		Tejaston.....	.....	.....	.....	1.80
Tuscaloosa.....	91	66	80.6	7.08		Tip Top.....	.....	.....	.....	2.50
Tuscumbia (1) f.....	93	68	77.6	8.13		Tombstone.....	99	63	78.6	3.59
Tuscumbia (2) f.....	94	58	78.8	6.17		Tucson (1)*.....	105	66	.....	5.66
Union Springs.....	98	70	80.8	2.46		Tucson (2)*.....	105	50	73.8	0.00?
Uniontown.....	94	67	80.9	8.73		Volunteer Springs.....	98	26?	67.6	2.50
Valley Head f.....	95	62	75.5	2.86		Walnut Grove.....	.....	.....	.....	2.10
Wiggins.....	102*	62*	82.8	7.41		Wilcox*.....	105	70	82.9	3.62
<i>Arizona.</i>						Willow Springs (Apache county).....	.....	.....	.....	2.74
Antelope Valley.....	.....	.....	.....	1.67		Willow Sp'gs (Pinal county).....	.....	.....	.....	3.06
Ash Canyon.....	.....	.....	.....	4.42						
Banghart's.....	110	.....	.....	5.50						



## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
Arizona—Cont'd.	0	0	0	Ins.	California—Cont'd.	0	0	0	Ins.
Winslow .....	101	85.0	78.4	0.65	King City* .....	97	40	62.0	0.00
Yuma* .....	108	84	94.2	0.00	Knight's Landing* .....	104	47	71.2	0.00
Arkansas.					La Grange .....	110	54	81.5	0.00
Brinkley* .....	96	58	78.8	5.57	Lathrop* .....	106	48	75.8	0.00
Camden* .....	94	57	79.5	4.15	Lemoore* .....	111	55	85.9	0.00
Conway .....	94	65	79.3	4.07	Lewis Creek* .....	110	64	88.0	0.00
Dayton* .....	96	63	80.6	3.16	Livermore* .....	98	52	66.8	0.00
Devall's Bluff* .....	98	58	81.7	5.75	Livingston* .....	110	60	82.1	0.00
El Dorado* .....	91	62	76.6	5.37	Long Beach* .....	96	64	73.2	0.00
Eureka Springs .....	98	53	78.0	6.61	Los Angeles* .....	100	58	72.0	0.00
Forrest City* .....	94	59	79.2	3.41	Los Banos* .....	110	62	81.8	0.00
Fulton* .....	97	56	78.5	2.98	Los Gatos* .....	99	56	72.3	0.00
Heber .....	97	56	78.5	2.10	Mammoth Tank* .....	120	84	100.2	0.00
Helena (1)* .....	98	64	81.4	3.87	Martinez* .....	94	51	70.3	0.00
Hot Springs .....	98	55	78.7	5.48	Marysville* .....	105	60	86.1	0.00
Lead Hill* .....	107	58	82.5	2.80	Menlo Park* .....	96	54	66.0	0.00
Little Rock B'ks. .....	95	65	80.5	3.30	Merced* .....	108	58	81.3	0.00
Lonohe .....	97	64	82.3	3.62	Modesto* .....	106	60	78.4	0.00
Malvern* .....	102	58	82.3	3.26	Mojave* .....	111	70	89.1	0.00
Monticello* .....	98	66	82.4	4.35	Montague* .....	104	70	80.3	0.00
Newport (1)* .....	98	60	80.2	4.50	Monterey* (Hotel .....	79	59	64.5	0.00
Oseola* .....	93	62	79.8	4.84	Mount Hamilton .....	92	50	67.2	0.00
Ozone* .....	91	59	76.4	9.50	Napa* .....	92	53	70.7	0.00
Pine Bluff* .....	96	66	82.2	6.27	National City* .....	92	59	70.0	0.01
Prescott* .....	94	64	80.4	4.10	Needles .....	119	77	98.8	0.00
Russellville* .....	97	60	81.8	12.00	Newark* .....	90	57	66.8	0.00
Stuttgart* .....	95	60	79.7	5.09	Newhall* .....	112	55	77.2	0.00
Texaskana* .....	100	68	82.3	5.10	Newman* .....	110	60	79.9	0.00
Washington* .....	98	67	79.8	4.98	Niles* .....	95	55	68.3	0.00
Winslow .....	89	57	76.9	6.49	Norwalk* .....	99	60	73.3	0.00
British Columbia.					Oakland (1)* .....	94	53	59.8	0.00
New Westminster .....	90	50	67.0	0.04	Oakland (2)* .....	70	50	62.0	0.00
California.					Ontario* .....	102	69	80.8	0.00
Alcatraz Island .....	65	48	55.5	0.00	Orland* .....	112	65	86.7	0.00
Almaden* .....	93	58	71.0	0.00	Oroville .....	102	56	80.0	0.00
American Hill* .....	100	58	70.2	0.00	Pajaro* .....	75	56	62.5	0.00
Anaheim* .....	104	58	73.0	0.00	Paso Robles* .....	104	50	73.1	0.00
Anderson* .....	110	62	87.0	0.00	Petaluma* .....	97	52	65.2	0.00
Angel Island .....	81	48	61.5	0.00	Placerville* .....	103	61	79.1	0.00
Antioch* .....	104	59	77.1	0.00	Pleasanton* .....	100	61	74.6	0.00
Aptos* .....	80	52	63.4	0.00	Pomona* .....	102	66	79.2	0.00
Athlone* .....	114	60	83.3	0.00	Presidio of San F* .....	80	47	55.8	0.00
Auburn* .....	105	56	76.5	0.00	Puente* .....	104	60	75.2	0.00
Bakersfield* .....	112	67	88.6	0.00	Red Bluff* .....	110	62	85.2	0.00
Barstow .....	112	60	87.5	0.00	Redding* .....	115	62	83.9	0.00
Beaumont* .....	113	70	86.4	0.00	Rocklin* .....	113	57	81.4	0.00
Benicia Barracks .....	99	50	67.9	0.00	Rumsey* .....	110	60	82.9	0.00
Berkeley .....	113	66	84.6	0.00	Sacramento (1)* .....	96	48	68.3	0.00
Bishop Creek* .....	114	85	92.2	0.00	Sacramento (2)* .....	95	60	74.1	0.00
Borden* .....	114	60	82.6	0.00	Salinas (1)* .....	78	53	57.1	0.00
Brentwood* .....	105	67	79.6	0.00	Salinas (2)* .....	67	56	60.3	0.00
Brighton* .....	104	55	77.6	0.00	Sanger Junction* .....	116	67	80.4	0.00
Byron* .....	108	66	81.6	0.00	San Ardo* .....	104	52	68.3	0.00
Cactus* .....	122	83	99.5	0.00	San Diego B'ks .....	85	59	69.0	0.00
Caliente* .....	112	70	90.2	0.00	San Fernando* .....	113	53	74.7	0.00
Calistoga* .....	104	48	67.5	0.00	San Gabriel* .....	106	60	75.7	0.00
Castroville* .....	69	53	60.5	0.00	San Jose* .....	93	35	66.1	0.00
Centerville* .....	100	58	69.5	0.00	San Luis Obispo .....	93	47	64.4	0.00
Chico* .....	114	65	85.2	0.00	San Mateo .....	88	59	66.6	0.00
Cicero .....	88	49	64.3	0.00	San Miguel* .....	104	50	72.9	0.00
Colfax* .....	102	60	77.3	0.00	San Pedro* .....	96	64	74.6	0.00
Colton* .....	114	60	82.3	0.00	Santa Ana .....	98	62	73.7	0.00
Corning* .....	111	64	88.2	0.00	Santa Barbara (1)* .....	107	53	62.2	0.00
Crescent City .....	105	52	70.9	0.14	Santa Barbara (2)* .....	88	60	69.7	0.00
Davisville* .....	112	67	88.2	0.00	Santa Clara* .....	94	49	64.6	0.00
Delano* .....	109	55	77.8	0.00	Santa Cruz* .....	96	52	67.1	0.00
Delta* .....	95	60	71.8	0.00	Santa Margarita* .....	106	52	76.9	0.00
Downey* .....	105	60	78.4	0.00	Santa Maria* .....	86	44	64.9	0.00
Dunsmuir* .....	100	49	71.7	0.33	Santa Monica* .....	83	62	70.8	0.00
Edgewood* .....	106	61	83.1	0.00	Santa Paula* .....	100	58	72.9	0.00
El Dorado* .....	110	58	76.5	0.00	Santa Rosa* .....	90	46	65.2	0.00
Elmira* .....	99	49	65.9	0.00	Seven Palms* .....	120	82	98.6	0.00
Emigrant Gap* .....	108	52	80.9	0.00	Sims* .....	103	45	72.1	0.00
Evergreen .....	110	56	78.7	0.00	Sisson* .....	94	60	71.3	0.00
Farmington* .....	98	45	67.2	0.00	Soledad* .....	86	50	62.9	0.00
Felton* .....	95	60	71.6	0.00	Soquel* .....	106	52	64.2	0.00
Florence* .....	109	62	81.5	0.00	South Side* .....	106	52	77.1	0.00
Folsom* .....	99	44	72.1	0.00	South Vallejo* .....	80	50	58.8	0.00
Fort Bidwell .....	110	49	69.8	0.00	Spadra* .....	100	59	72.6	0.00
Fort Gaston .....	69	40	58.0	0.00	Steeles .....	88	44	61.6	0.00
Fort Mason .....	115	65	90.8	0.00	Summit* .....	84	43	61.6	0.00
Fruto* .....	113	66	84.5	0.00	Suisun* .....	102	55	70.5	0.00
Galt* .....	106	62	77.5	0.00	Susanyville* .....	110	52	76.5	0.05
Georgetown* .....	99	56	75.5	0.00	Tehachapi* .....	100	70	82.3	0.00
Gilroy* .....	97	55	68.6	0.00	Tehama* .....	115	72	85.6	0.00
Girard* .....	102	67	79.7	0.00	Templeton* .....	108	50	73.5	0.00
Glen Ellen* .....	103	63	67.7	0.00	Tracy* .....	108	50	79.5	0.00
Goshen* .....	110	63	88.9	0.00	Traver* .....	111	66	89.0	0.00
Hollister* .....	97	56	68.8	0.00	Tropico* .....	103	57	73.4	0.00
Hornbrook* .....	107	60	79.9	0.00	Truckee* .....	98	46	69.3	0.00
Hydesville* .....	87	42	58.9	0.15	Tulare* .....	113	67	88.3	0.00
Indio* .....	114	82	96.4	0.00	Turlock* .....	106	64	81.3	0.00
Ione* .....	104	54	77.2	0.00	Vacaville (1)* .....	105	58	74.4	0.00
Iowa Hill* .....	100	67	77.3	0.00	Vacaville (2)* .....	107	60	75.0	0.00
Jolon .....	114	60	83.2	0.00	Valley Springs* .....	101	65	82.5	0.00
Julian* .....	101	65	78.3	0.00	Volcano Springs* .....	126	80	99.8	0.00
Keeler* .....	107	69	83.2	0.00	Walla Walla Creek* .....	98	43	70.0	1.11
Keeno* .....	104	63	79.3	0.00	Walnut Creek .....	109	50	70.5	0.00
Kingsburgh* .....	112	70	87.9	0.00	Westley* .....	105	68	84.1	0.00
					Wheatland .....	106	47	75.6	0.00
					Whittier* .....	104	61	78.1	0.00

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
California—Cont'd.	0	0	0	Ins.	District of Columbia.				
Williams*.....	115	66	93.9	0.00	Washington B'ks ..	93	59	72.2	0.06
Willow (1).....	112	50	79.4	0.00	Florida.				
Willow (2)*.....	109	58	82.2	0.00	Altamonte Springs†	95	60	80.9	10.94
Winters*.....	110	57	85.5	0.00	Alva†.....	99	70	80.9	7.69
Woodland*.....	100	54	75.8	0.00	Archer†.....	99	69	83.8	8.72
Canada.					Fort Barrancas.....	95	69	81.7	12.35
McGill Col. Obser-	88	52	68.0	7.16	Fort Meade*.....	91	74	78.6	5.26
vatory, Montreal.					Homeland*.....	98	73	82.3	4.50
Colorado.					Kissimmee City.....	98	70	82.4	7.04
Alma.....	78	29	57.8	1.53	Live Oak†.....	98	62	81.4	9.56
Aspen.....	88	25	59.2	1.45	Manatee†.....	92	70	82.8	10.01
Breckenridge.....	102	52	77.3	1.07	Matanzas*.....	91	72	79.6	8.09
Canon City.....	87	43	54.9	1.48	Merritt's Island†.....	91	70	80.3	4.26
Chimney*.....	105	43	60.4	0.68	St. Francis B'ks.....	94	70	80.7	6.18
Coulter*.....	87	43	54.9	0.75	Tallahassee†.....	95	70	80.7	9.48
Delta†.....	63	30	44.2	1.90	Villa City*.....	98	73	80.6	9.48
Dolly Varden Mine.....	81	45	56.5	0.61	Georgia.				
Durango†.....	84	42	62.4	1.71	Albany†.....	98	70	83.6	5.32
Eagle Farm.....	102	46	73.8	0.51	Allapaha†.....	97	58	82.4	3.76
Elkhorn.....	97	38	68.3	0.78	Athens (1).....	94	65	78.0	2.46
Fort Collins.....	98	47	72.5	0.82	Athens (2)†.....	100	62	81.6	4.06
Fort Crawford.....	88	45	65.8	3.26	Bainbridge†.....	98	70	82.6	2.19
Fort Lewis.....	101	50	72.6	2.65	Camak†.....	96	62	80.6	7.06
Fort Logan.....	109	43	76.6	2.62	Cartersville†.....	97	64	79.9	6.55
Fort Lyon.....	81	45	56.5	0.61	Columbus†.....	98	66	81.8	8.42
Fraser*.....	84	42	62.4	1.71	Diamond*.....	96	65	76.7	20.45
Georgetown.....	102	46	73.8	0.51	Duck†.....	86	58	73.6	10.51
Glenwood Springs.....	97	34	60.0	0.86	Eastman†.....	100	66	84.2	5.15
Grand Lake*.....	99	48	74.4	1.90	Forsyth*.....	95	73	81.5	8.21
Greeley.....	97	46	66.8	2.59	Fort McPherson.....	96	64	79.7	8.67
Husted.....	107	38	73.1	3.52	Gainesville†.....	90	70	76.9	3.84
Julesburg.....				2.14	Gillsville.....	90	70	80.3	.....
Lamar.....				0.68	Griffin†.....	96	66	80.7	3.39
La Porte.....	77	36	57.1	0.84	Hephzibah*.....	90	72	80.6	8.65
Leadville.....	93	38	66.1	1.26	Jesup†.....	101	69	83.6	8.07
Livermore.....	96	45	67.4	3.00	Macon†.....	96	68	80.3	5.95
Monte Vista.....	104	62*	77.4	0.71	Marietta†.....	91	61	76.3	9.29
Middle Box Elder.....	94	41	66.6	0.94	Milledgeville†.....	95	67	81.0	0.61
Palmer Lake.....	86	50	68.9	10.58	Millen†.....	100	66	82.5	6.84
Paoli.....	93	38	66.1	1.26	Newnan†.....	94	64	80.0	4.31
Rifle Falls.....	96	45	67.4	3.00	Point Peter*.....	72	81.0	4.35	.....
Rocky Ford.....	104	62*	77.4	0.71	Quitman (2)†.....	98	64	81.6	7.13
Saguache.....	94	41	66.6	0.94	Smithville†.....	100	68	83.6	7.13
San Luis Ex. Sta.....	86	50	68.9	10.58	Thomasville (1).....	97	69	82.2	7.63
San View.....	93	38	66.1	1.26	Thomasville (2)†.....	102	69	82.4	7.64
Thon.....	95	41	69.7	1.84	Toccoa†.....	94	62	78.0	7.47
Upper Pine.....				3.02	Union Point†.....	98	60	80.0	6.11
Connecticut.					Washington†.....	94	62	79.6	4.35
Birmingham.....	88	50	68.9	10.58	Way Cross†.....	94	70	81.8	5.83
Canton.....	86	50	68.9	10.58	Waynesborough†.....	94	65	88.4	8.83
Clark's Falls.....	93	38	66.1	1.26	West Point†.....	96	72	83.4	4.40
Colchester.....	96	45	67.4	3.00	Woolley's Ford*.....	90	64	75.8	.....
Falls Village.....	104	62*	77.4	0.71	Mass.				
Fort Trumbull.....	93	31	72.4	7.53	Boise Barracks.....	102	42	74.3	0.00
Hartford (2).....	101	43	70.2	10.97	Ena.....	94	45	72.5	0.18
Lake Konomoc.....	101	43	70.2	10.97	Fort Sherman.....	94	43	74.2	T.
Lebanon.....	86	49	67.9	11.39	Lewiston.....	101	58	81.5	0.00
Mansfield.....	88	50	68.9	13.43	Soda Springs†.....	94	26†	67.5	0.18
Middletown.....	86	49	67.9	11.39	Illinois.				
New Britain.....	86	40	63.6	10.58	Atwood.....	90	52	.....	6.15
New Hartford (1)*.....	86	40	63.6	10.58	Aurora.....	93	51	71.8	5.08
New Hartford (2).....	86	40	63.6	10.58	Beardstown.....	.....	.....	.....	5.31
North Woodstock.....	87	50	69.8	15.55	Beason.....	90	56	72.4	4.71
Pomfret.....	87	50	69.8	15.55	Belvidere.....	91	56	70.8	2.39
South Manchester.....	84	55	69.3	11.16	Brush Hill.....	98	62	75.9	4.70
Thompson*.....	86	56	68.5	9.35	Cedarville.....	90	59	71.4	4.31
Uncasville.....	88	49	69.7	10.83	Centralia.....	96	60	77.0	4.10
Voluntown*.....	86	56	68.5	9.35	Charleston.....	93	54	74.8	5.85
Wallingford.....	88	49	69.7	10.83	Collinsville.....	94	57	76.8	2.61
Waterbury.....	88	49	69.7	10.83	Dwight.....	94	52	74.4	6.12
West Simsbury.....				8.67	Fairfield.....	92	62	80.1	4.72
Dakota.					Flora.....	93	53	75.0	6.14
Alexandria†.....	104	42	72.4	2.15	Fort Sheridan.....	91	52	69.7	3.57
Armour*.....	98	37	70.4	2.92	Goldsboro.....	92	66	76.8	5.17
Brookings.....	101	43	67.2	3.03	Grand Tower†.....	95	53	75.0	5.55
Carrington†.....	100	39	69.3	3.69	Greenville.....	91	60	74.7	2.87
Clark.....	101	43	67.2	3.03	Griggsville.....	91	60	74.7	2.87
Davenport.....	96	40	70.0	1.50	Hennepin.....	96	53	73.0	4.76
De Smet†.....	96	40	70.0	1.50	Irishtown.....	94	63	77.3	4.46
Fort A. Lincoln.....	98	46	69.7	1.45	Jordans Grove.....	92	58	70.4	3.43
Fort Bennett.....	106	48	74.9	5.49	Lacon.....	93	66	75.2	4.31
Fort Buford.....	101	41	68.8	0.63	Lake Forest.....	90	50	68.9	4.77
Fort Meade.....	97	34	68.4	6.38	Lanark.....	89	57	73.8	6.79
Fort Pembina.....	97	37	66.1	1.66	Louisville.....	92	59	75.0	6.40
Fort Randall.....	103	48	74.9	5.49	Mascoutah.....	94	57	.....	.....
Fort Sully.....	108	51	75.0	4.18	Mattoon*.....	96	57	73.7	7.99
Fort Totten.....	96	37	68.2	2.05	McLeansborough.....	102	55	74.9	4.31
Fort Yates.....	101	38	67.1	3.41	Mount Carmel†.....	95	52	70.8	3.60
Gallatin*.....	102	46	63.7	3.91	Mount Morris†.....	95	62	74.6	7.39
Kimball†.....	47	70.6	3.93	.....	Olney.....	95	62	74.6	7.39
Napoleon†.....	96	45	67.9	2.85	Oswego.....	92	54	70.8	4.44
New England City†.....	97	37	67.3	2.58	Ottawa.....	93	62	74.2	5.67
Onida*.....	100	48	70.6	3.14	Palestine†.....	92	53	75.6	2.46
Roscoe†.....	106	42	68.7	3.15	Pana.....	94	64	78.9	2.44
Spearfish*.....	93	52	70.5	8.75	Pekin.....	96	55	75.8	7.63
Spring Lake*.....	96	50	69.3	8.75	Peoria (1)†.....	.....	.....	.....	7.64
Steele†.....	101	40	69.0	2.24	Peoria (2).....	94	57	76.6	4.67
Wahpeton.....	95	40	69.6	0.94	Philo*.....	93	52	73.9	4.45
Webster†.....	96	43	71.0	2.84	Pontiac.....	96	52	73.4	4.45
Wolsey*.....	103	44	74.1	3.91	Quincy.....	97	53	75.9	8.20
Woonsocket.....	104	41	70.9	3.91	Richview.....	95	59	75.3	3.44
Delaware.					Riley*.....	88	55	69.6	2.88
Kirkwood*.....	68	77.8	.....	.....	Rockford.....	92	52	72.0	7.99
					Rock Island Arsenal.....	91	50	70.9	3.97
					Sandwich.....	95	61	74.5	4.43
					South Evanston.....	92	49	69.8	4.43



## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<b>Illinois—Cont'd.</b>	°	°	°	Ins.	<b>Kansas—Cont'd.</b>	°	°	°	Ins.
Byamora	93	51	69.6	4.48	Atwood	100	62	78.3	5.50
Warsaw	95	52	71.9	6.54	Augusta	94	63	78.6	6.55
Watseka	93	66	69.3	4.07	Belleville	94	63	78.6	6.55
Wheaton	93	62	75.1	5.70	Bendena	107	56	5.50	4.15
White Hall	98	62	75.1	5.70	Brookville	102	64	2.27	4.15
Willow Hill	94	57	75.4	2.77	Bucklin	106	62	80.9	3.99
Windsor	94	57	75.4	2.77	Buffalo Park	97	47	75.9	11.75
Winnebago	94	58	75.4	2.77	Burr Oak	103	60	3.25	4.60
<b>Indiana.</b>					Carleiro	103	60	77.1	4.60
Angola	97	54	74.2	7.01	Cawker City	103	42	74.0	2.41
Blue Lick	89	66	74.2	7.03	Cold Water	106	58	3.85	2.25
Butlerville	94	64	76.1	5.65	Colby	98	56	78.6	3.05
Cannelton	94	54	75.9	6.17	Conway	99	59	76.7	5.24
Columbia City	93	60	70.2	4.35	Cunningham	104	54	4.90	6.20
Columbus	90	59	73.1	3.15	Dwight	96	57	79.6	7.26
Connorsville	90	59	73.1	3.15	Elk Falls	106	51	78.2	1.00
Dana	88	56	70.1	6.20	Ellis (1)	104	58	2.25	2.60
De Gonia Springs	92	50	73.1	6.81	Ellis (2)	102	62	80.1	7.59
Delphia	92	50	73.1	6.81	Englewood	106	47	76.6	2.78
Evansville	92	60	73.7	3.69	Fort Hays	91	55	76.6	3.21
Farmersburg	92	60	73.7	3.69	Ft. Leavenworth (1)	91	55	76.6	3.21
Huntington	94	62	77.3	9.50	Ft. Leavenworth (2)	98	55	77.4	6.92
Huntington	94	62	77.3	9.50	Frederick	100	41	76.4	6.59
Jeffersonville	92	58	73.2	3.39	Gibson	114	47	79.3	1.20
La Fayette	95	53	73.1	5.29	Globe	93	62	76.4	5.85
Logansport	90	59	76.4	10.50	Gognac	104	63	5.40	1.10
Marengo	92	53	72.7	3.10	Gorham	102	44	77.6	3.50
Marysville	96	51	73.2	4.22	Grainfield	102	52	77.6	3.50
Mount Vernon (1)	94	51	76.0	5.93	Grinnell	106	60	77.6	3.50
Mount Vernon (2)	94	51	76.0	5.93	Halstead	96	56	77.5	2.99
Muncie	96	51	76.0	5.93	Havensville	99	58	75.9	2.90
New Providence	96	51	76.0	5.93	Hays City	108	65	6.00	6.00
Point Isabel	96	51	76.0	5.93	Hill City	94	58	72.1	6.13
Princeton	96	51	76.0	5.93	Hixie	105	63	80.0	5.28
Richmond	91	54	74.0	4.00	Hugoton	101	58	78.8	7.40
Rockville	94	54	73.0	6.25	Hymer	101	58	78.8	7.40
Salem	93	62	77.2	7.68	Independence	100	60	77.5	4.45
Scalesville	88	62	72.9	6.74	Junction City	100	60	77.5	4.45
Seymour	90	60	74.0	3.92	Kanopolis	100	60	77.5	4.45
Shelbyville	94	54	74.0	6.03	Kirwin	100	60	77.5	4.45
Spiceland	92	53	75.4	5.30	La Harpe	94	58	72.1	6.13
Sumner	94	57	75.3	6.93	Lebo	99	53	78.2	7.73
Vera	94	57	75.3	6.93	Leoti	108	45	77.7	1.88
Vincennes	86	63	73.1	6.40	Lisbon	108	65	80.37	0.65
Worthington	96	53	73.1	6.40	Luray	102	52	77.0	4.02
<b>Indian Territory.</b>					Macksville	100	52	77.0	4.02
Caddo Creek	96	72	82.4	2.39	Manhattan (1)	98	50	75.1	8.14
Cantonment	96	72	82.4	2.39	Manhattan (2)	98	50	75.1	8.14
Euflavia	96	72	82.4	2.39	Manhattan (3)	98	50	75.1	8.14
Fort Gibson	102	65	80.2	2.84	Marmaton	93	52	77.3	10.28
Fort Reno	103	65	80.2	2.84	McAlister	108	60	77.5	3.95
Fort Sill	104	65	80.2	2.84	Minneapolis	108	60	77.5	3.95
Fort Supply	111	51	80.1	2.17	Monument	108	60	77.5	3.95
Jimtown	88	56	76.0	5.93	Morse	98	50	70.4	2.75
Lehigh	94	57	75.3	6.93	Oakley	106	58	70.4	2.75
Oklahoma City	100	56	79.0	2.80	Oberlin	102	65	5.50	1.30
Tulsa	94	57	75.3	6.93	Ogallah	102	65	5.50	1.30
Woodward	94	57	75.3	6.93	Quinter	100	60	78.9	6.74
<b>Iowa.</b>					Rago	100	70	77.1	7.43
Amara	94	46	73.3	3.95	Rome	100	58	77.1	7.43
Ames	92	50	73.2	4.10	Russell	98	55	79.4	4.83
Bancroft	95	46	72.5	3.45	Salina	103	59	78.2	7.84
Blakeville	102	60	72.6	2.50	Sedan	94	60	75.5	5.89
Cedar Rapids	95	47	72.6	5.79	Seneca	102	60	75.5	5.89
Clarinda	93	59	75.2	5.30	Shockey	102	60	75.5	5.89
Clinton	96	52	73.2	2.86	Stockton	106	62	75.5	5.89
Cresco	92	46	69.7	2.86	Stolzenbach	96	57	75.4	3.01
Cromwell	92	46	69.7	2.86	Toronto	96	57	75.4	3.01
Dysart	92	53	71.9	3.70	Tribune	105	48	77.6	0.98
Elkader	94	40	70.8	1.96	Victoria	103	60	78.3	2.67
Fayette	94	40	70.8	1.96	Wakefield	103	60	78.3	2.67
Fort Madison	95	62	78.0	4.31	Walker	99	60	78.3	2.67
Gillett	95	59	69.5	2.90	Wallace	104	62	78.3	2.67
Glenwood (1)	98	53	76.3	5.50	Walnut Grove	94	61	74.6	2.35
Glenwood (2)	98	53	76.3	5.50	Wellington	95	56	77.6	7.99
Grinnell	90	48	72.6	5.14	Wekan	105	47	75.1	0.20
Hampton	93	46	71.3	2.70	Wilson	102	65	4.22	3.30
Humboldt	93	46	71.3	2.70	Winona	96	54	76.6	6.00
Independence	92	53	73.8	1.62	Yates Center	96	54	76.6	6.00
Iowa City	91	53	73.8	1.62	<b>Kentucky.</b>				
Le Claire	94	48	74.7	6.28	Ashland	90	64	69.5	4.12
Logan	94	48	74.7	6.28	Bernstadt	94	60	78.8	6.16
Manson	94	48	74.7	6.28	Bowling Green	94	60	78.8	6.16
Maquoketa	96	50	73.8	1.96	Burnside	99	58	75.0	3.05
McGregor	100	50	73.8	1.96	Canton	99	58	75.0	3.05
Monticello	95	47	73.2	1.96	Catlettsburgh	99	58	75.0	3.05
Mount Pleasant	95	47	73.2	1.96	Earlinton	99	58	75.0	3.05
Mount Vernon	96	57	75.6	4.87	Eldysville	99	58	75.0	3.05
Muscataine (1)	94	51	73.0	6.60	Falmouth (2)	96	55	75.1	8.59
Muscataine (2)	93	58	74.6	2.38	Frankfort (2)	96	55	75.1	8.59
Oakalosa (1)	93	58	74.6	2.38	Franklin	99	65	77.1	6.87
Oakalosa (2)	93	58	74.6	2.38	Greensburgh	93	63	76.2	2.88
Sac City	88	53	69.0	8.17	Madisonville	93	63	76.2	2.88
Storm Lake	92	53	73.0	6.15					
Vinton	91	49	71.1	3.54					
Washington	98	54	79.1	1.19					
Webster City	94	53	72.5	3.44					
West Bend	90	55	72.6	4.95					
<b>Kansas.</b>									
Abilene	98	49	74.8	5.05					
Allison	99	49	74.8	5.05					
Arlington	99	49	74.8	5.05					

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<b>Kentucky—Cont'd.</b>					<b>Massachusetts—Con.</b>				
McHenry †	97	62	75.7	4.36	Fiskdale	86	53	68.2	8.72
Mount Sterling †	90	62	73.4	5.42	Fitchburg (1) *	84	50	68.4	7.17
Newport Barracks	93	58	75.2	4.21	Fitchburg (2)	84	50	68.4	7.35
Owenton †	94	59	74.8	6.45	Fort Warren	85	52	68.1	7.87
Paducah †	95	50	75.4	4.91	Framingham	88	50	70.4	9.34
Pellville †	95	50	75.4	4.91	Gilbertville	88	45	68.4	9.63
Richmond *	98	59	79.1	6.48	Groton	86	52	69.4	6.91
Shelbyville *	94	55	75.8	8.41	Heath *	92	50	72.5	7.25
South Fork †	90	63	75.0	2.03	Holyoke	90	52	72.5	8.86
Springfield †	92	55	72.8	6.81	Lake Cochituate.	90	44	69.4	9.10
Williamsburgh †	92	55	72.8	4.90	Lawrence	93	52	70.7	7.04
<b>Louisiana.</b>					Leicester	88	49	66.6	9.62
Abbeville	90	75	83.3	7.49	Leominster	84	58	70.6	5.17
Alexandria	97	65	82.0	6.74	Long Plain *	84	58	70.6	5.17
Amite City †	94	62	78.2	5.85	Lowell (1)	88	53	69.8	6.12
Cameron †	102	68	84.5	8.52	Lowell (2)	88	51	69.2	6.12
Cheneyville (2) †	98	68	80.3	2.68	Lowell (3)	88	54	70.9	9.05
Clinton	99	55	79.9	6.96	Ludlow	86	42	66.6	10.60
Convent	95	53	79.3	5.20	Lynn	80	52	67.6	8.75
Coushatta (1) †	98	68	83.1	4.36	Mansfield	85	49	69.6	9.05
Coushatta (2) †	98	68	83.1	4.36	Medford	86	46	68.5	8.46
Crowley	93	71	82.1	4.85	Middleborough	86	46	68.5	8.46
Delhi †	98	68	83.1	4.36	Milton *	86	52	67.2	6.74
Farmerville	94	66	81.5	6.30	Monson	87	43	68.0	9.30
Franklington	96	66	81.5	5.30	Mount Nonotuck	87	43	68.0	9.30
Girard †	96	66	81.5	5.94	Mystic Lake	87	43	68.0	9.30
Grand Cane	95	70	82.6	6.10	Mystic Station.	87	43	68.0	9.30
Grand Coteau	93	72	82.8	4.28	Nahant.	82	53	65.6	6.28
Hammond	97	68	82.8	8.05	New Bedford (1) *	83	53	67.3	5.45
Houma †	94	70	81.2	10.49	New Bedford (2)	83	52	68.1	5.44
Jackson Barracks.	92	71	80.8	2.28	New Bedford (3).	86	52	69.0	7.51
Jeanerette	90	69	79.4	8.04	Newburyport (1)	86	52	68.1	6.79
Jennings	98	70	83.5	2.40	Newburyport (2)	86	52	68.1	6.79
La Fayette (2) †	97	70	83.5	2.40	Northampton	90	51	72.7	9.44
Lake Charles	97	70	83.5	2.40	North Billerica	91	50	69.5	7.18
Liberty Hill	100	68	80.7	3.50	Plymouth *	84	58	69.0	6.32
Luling	98	68	82.5	5.64	Princeton	83	46	66.2	8.76
Mandeville	98	68	83.1	3.26	Provincetown	84	54	69.0	4.30
Many	95	68	83.8	8.05	Randolph	84	54	69.0	6.85
Marksville.	96	64	82.4	3.75	Royalston *	88	58	69.8	12.38
Maurepas	97	59	81.5	4.78	Salem (1) *	84	57	70.5	7.05
Melville †	96	68	82.2	5.05	Salem (2)	94	42	73.3	6.38
Minden †	99	69	82.7	2.13	Somerset	88	47	71.4	7.52
Monroe †	96	69	83.1	9.55	South Hingham	88	53	68.8	9.08
Mount Airy	96	69	82.7	4.42	Springfield Arm'y.	82	53	66.8	7.16
Natchitoches †	95	66	82.8	3.72	Swampscott	82	53	66.8	8.46
New Iberia	95	71	81.6	5.72	Taunton (1)	87	48	69.0	9.68
Plaquemine	96	64	80.8	4.30	Taunton (2)	86	46	69.1	7.92
Pointe à la Hache *	92	72	82.9	6.61	Taunton (3)	86	46	69.1	7.92
Port Eads.	97	71	82.2	8.64	Waltham	89	49	69.0	9.90
Saint Joseph.	92	67	81.8	4.63	Wellesley	92	49	72.7	8.34
Shell Beach	93	74	83.2	4.50	Westborough *	84	49	67.9	5.81
Sugar Ex. station.	95	68	83.2	7.45	Williamstown	82	49	67.9	5.81
Thibodeaux.	95	71	83.0	4.13	Winchester	85	55	69.6	7.92
Trinity	100	66	83.7	7.48	Worcester (1) *	87	54	79.0	8.33
Vidalia	92	74	84.3	10.38	Worcester (2)	87	54	79.0	8.33
Winnfield *	92	74	84.3	10.38	<b>Mexico.</b>				
<b>Maine.</b>					Guanajuato	83	52	67.5	2.80
Bar Harbor	82	52	65.2	2.07	Leon de Aldemas.	88	56	71.6	7.42
Belfast *	78	58	64.5	5.00	Mazatlan	89	80	84.2	9.18
Calais	84	48	65.8	3.24	Mexico	80	51	65.1	3.40
Cornish	88	54	68.8	4.47	Topo Chico *	92	78	83.8	2.08
Fairfield	86	44	66.2	3.11	Zacatecas	83	45	62.4	2.28
Fort Preble	82	50	66.4	2.90	<b>Michigan.</b>				
Gardiner.	81	48	66.1	3.21	Adamsville	92	47	69.9	4.05
Kennebec Arsenal.	84	51	67.3	6.50	Adrian.	90	53	74.2	1.87
Kent's Hill	82	52	67.8	5.22	Albion (1)	91	52	70.5	3.32
Lewiston	83	44	65.1	4.98	Allegan	92	40	66.0	3.32
Mayfield *	83	48	66.4	3.23	Alma	91	52	70.5	1.92
Orono †	79	50	66.9	1.72	Ann Arbor	92	50	65.1	3.79
Petit Menan	81	48	63.6	1.72	Arbela	90	48	69.8	4.35
Sorrento	80	52	60.9	9.90	Atlantic	88	54	68.7	5.25
West Jonesport	81	52	60.9	9.90	Ball Mountain	87	45	65.7	3.09
<b>Maryland.</b>					Bear Lake	84	50	71.8	1.69
Barren Creek Sp'gs †	89	57	75.7	12.48	Bell Branch.	87	45	65.7	2.06
Cumberland (1)	88	54	73.6	2.74	Benzonia	86	52	71.3	1.93
Pallaton	89	56	73.5	12.37	Berlin	91	56	71.6	5.88
Fort McHenry	88	60	74.5	10.18	Berrien Springs *	96	56	71.6	1.60
Frederick	92	58	75.8	7.60	Big Rapids	91	45	67.0	3.82
Gaithersburg *	92	62	71.4	8.46	Birmingham	94	46	69.8	1.00
Salena †	92	64	78.0	13.02	Bronson	88	54	68.7	5.25
Salena † *	92	64	78.0	13.02	Buchanan.	87	45	63.4	3.09
Sambells *	92	64	78.0	13.02	Calumet	92	42	70.2	3.82
Jewell *	89	59	77.0	9.50	Cassopolis	92	42	70.2	3.82
McDonogh	83	55	74.2	5.92	Charlevoix	90	42	63.5	1.40
Woodstock	83	55	74.2	5.92	Chase	90	48	69.5	1.83
<b>Massachusetts.</b>					Chelsea	92	50	71.3	1.94
Amherst	86	43	68.8	9.49	Colon	92	50	71.3	1.94
Amherst Ex Sta (1).	86	46	68.1	8.35	Concord.	92	50	71.3	1.94
Amherst Ex Sta (2).	84	54	69.5	9.09	Courtland	92	50	71.3	1.94
Beverly Farm	83	50	66.1	8.47	Deer Lake	91	52	71.0	1.13
Blue Hill (sum't).	83	48	68.6	8.24	Eden	95	53	67.2	1.13
Blue Hill (base)	86	48	68.6	8.24	Fitchburgh	93	45	69.3	2.34
Blue Hill (valley).	86	48	68.6	8.24	Flint	87	43	62.3	3.10
Boston.	88	51	69.6	3.43	Fort Brady	83	48	64.1	2.62
Brewster	84	53	69.2	6.52	Fort Mackinac	94	47	71.4	1.69
Cambridge (1)	88	50	70.9	9.23	Fort Wayne.	82	57	70.8	2.00
Cambridge (2)	89	50	67.0	5.61	Fremont	89	38	65.4	2.47
Chestnut Hill.	89	50	67.0	5.61	Grand Rapids.	85	50	69.7	2.38
Chicopee.	82	54	68.7	4.09	Grayling	95	33	67.2	3.55
Clinton	86	49	68.4	3.39	Gulliver Lake.	85	42	64.2	2.45
Cotuit	84	55	68.5	6.20	Hanover	90	51	69.9	2.98
Deerfield (2) *	86	52	69.0	5.22	Harrisville	95	48	66.6	1.50
Dudley	89	57	70.4	9.90					
Fall River (1).	84	55	68.5	6.20					
Fall River (2).	86	52	69.0	5.22					



## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Michigan—Cont'd.</i>					<i>Mississippi—Cont'd.</i>				
Hart	95	55	72.3	2.90	Water Valley	100	66	83.4	3.72
Hastings	91	55	70.5	1.52	Waynesboro' (1)†	95	65	79.3	5.11
Highland Station	98	58	73.8	1.16	Waynesboro' (2)†	95	65	82.2	5.05
Hillman	95	58	66.7	1.09	Yasoo City†	95	65	82.2	5.85
Hillsdale	95	58	71.1	3.54	<i>Missouri.</i>				
Hudson	92	48	68.4	4.07	Boonville	90	54	79.4	4.56
Ionia	95	48	70.2	2.70	Carthage	90	54	79.4	4.56
Ivan	93	43	67.0	1.89	Conception	90	54	79.4	4.56
Jeddo	95	50	75.6	1.59	Excelsior Springs*	97	54	79.4	4.56
Kalamazoo	90	33	70.8	4.84	Fox Creek	90	54	79.4	4.56
Lansing	90	33	70.8	4.84	Frankford (1)*	99	54	79.4	4.56
Lathrop	102	40	67.5	3.02	Glasgow	99	54	79.4	4.56
Madison	98	48	72.4	4.25	Grand Pass	94	54	79.4	4.56
Marshall	94	49	70.9	2.35	Hermann†	91	54	79.4	4.56
May	78	50	64.2	3.55	Ironton	91	54	79.4	4.56
Mio	92	41	66.9	1.33	Jefferson Barracks	95	53	76.8	1.28
Montague	84	47	65.0	2.09	Jerome†	95	53	76.8	1.28
Mottville	89	49	67.9	3.17	Kansas City	98	56	78.2	3.42
Noble	92	36	69.2	2.19	Kirksville	98	56	78.2	3.42
North Adams	92	36	69.2	2.19	Lamont	99	52	79.3	1.79
North Aurelius	89	42	68.8	2.43	Langdon	99	52	79.3	1.79
North Marshall	89	42	68.8	2.43	Louisiana Bridge†	98	56	78.2	3.42
Olivet	87	41	67.8	1.83	Mexico	102	60	80.1	2.18
Otsego	90	40	68.7	1.79	Miami	102	60	80.1	2.18
Ovid	93	48	70.1	2.36	New Frankfort*	96	60	80.1	2.18
Paw Paw	91	48	72.4	4.89	New Haven	96	60	80.1	2.18
Petersburgh	92	47	70.4	2.31	Oregon	91	56	73.5	4.50
Pontiac	86	53	70.6	1.57	Ozark*	98	46	79.0	2.52
Pulaski	92	53	72.5	2.86	Princeton*	98	46	79.0	2.52
Rawsonville	96	50	70.0	1.70	Saint Charles (1)†	100	56	80.8	1.02
Roscommon	96	50	70.0	1.70	Saint Joseph†	100	56	80.8	1.02
Saint Ignace	92	51	71.1	2.60	Sedalia	100	56	80.8	1.02
Saint John's	92	51	71.1	2.60	Shelbina	100	56	80.8	1.02
Sand Beach	91	50	69.0	1.81	Shelbina	100	56	80.8	1.02
Standish	96	44	64.0	1.78	Shelbina	100	56	80.8	1.02
Stanton	89	47	68.4	4.20	Shelbina	100	56	80.8	1.02
Stockbridge	92	53	72.5	2.86	Shelbina	100	56	80.8	1.02
Traverse City (1)	95	43	65.4	2.63	Shelbina	100	56	80.8	1.02
Traverse City (2)	93	34	64.5	3.35	Shelbina	100	56	80.8	1.02
Thornville	92	50	71.7	1.90	Shelbina	100	56	80.8	1.02
Vandalia	92	50	71.7	1.90	Shelbina	100	56	80.8	1.02
Vienna	90	47	67.8	2.58	Shelbina	100	56	80.8	1.02
Washington	90	47	67.8	2.58	Shelbina	100	56	80.8	1.02
Weldon Creek	91	44	67.0	2.44	Shelbina	100	56	80.8	1.02
West Branch	91	44	67.0	2.44	Shelbina	100	56	80.8	1.02
Williamston	88	53	70.3	3.15	Shelbina	100	56	80.8	1.02
Ypsilanti (1)	92	49	70.4	2.43	Shelbina	100	56	80.8	1.02
Ypsilanti (2)	91*	52	70.7	2.68	Shelbina	100	56	80.8	1.02
<i>Minnesota.</i>					Shelbina	100	56	80.8	1.02
Alexandria†	96	56	70.4	3.66	Shelbina	100	56	80.8	1.02
Brainerd	96	56	70.4	3.66	Shelbina	100	56	80.8	1.02
Farmington	100	52	71.9	1.80	Shelbina	100	56	80.8	1.02
Fergus Falls†	96	56	70.4	3.66	Shelbina	100	56	80.8	1.02
Fort Ripley†	100	48	71.5	1.69	Shelbina	100	56	80.8	1.02
Fort Snelling	100	48	71.5	1.69	Shelbina	100	56	80.8	1.02
Grand Meadow	98	52	70.9	2.64	Shelbina	100	56	80.8	1.02
L. Winnibigoshish	98	52	70.9	2.64	Shelbina	100	56	80.8	1.02
Leech Lake	90	39	63.4	4.58	Shelbina	100	56	80.8	1.02
Le Sueur*	95	54	73.1	2.33	Shelbina	100	56	80.8	1.02
Mankato	95	49	70.8	3.68	Shelbina	100	56	80.8	1.02
Medford	92	43	68.6	3.68	Shelbina	100	56	80.8	1.02
Minneapolis (1)*	99	46	71.0	3.69	Shelbina	100	56	80.8	1.02
Morris	90	35	68.3	3.69	Shelbina	100	56	80.8	1.02
Northfield	90	35	68.3	3.69	Shelbina	100	56	80.8	1.02
Ortonville†	92	50	72.2	1.83	Shelbina	100	56	80.8	1.02
Owatonna	95	44	69.4	3.70	Shelbina	100	56	80.8	1.02
Pine River	96	55	72.7	2.63	Shelbina	100	56	80.8	1.02
Pokeyama Falls	90	36	63.0	4.34	Shelbina	100	56	80.8	1.02
Red Wing	95	50	70.5	2.23	Shelbina	100	56	80.8	1.02
Redwood Falls†	92	50	72.2	1.83	Shelbina	100	56	80.8	1.02
Rolling Green	92	50	72.2	1.83	Shelbina	100	56	80.8	1.02
Tracy†	92	50	72.2	1.83	Shelbina	100	56	80.8	1.02
<i>Montissippi.</i>					Shelbina	100	56	80.8	1.02
Aberdeen†	94	62	77.7	7.89	Shelbina	100	56	80.8	1.02
Agricultural College	97	61	81.2	7.73	Shelbina	100	56	80.8	1.02
Batesville†	100	62	81.8	8.27	Shelbina	100	56	80.8	1.02
Booneville†	93	61	79.6	5.35	Shelbina	100	56	80.8	1.02
Brookhaven†	98	64	82.1	6.53	Shelbina	100	56	80.8	1.02
Canton	91	71	81.1	3.03	Shelbina	100	56	80.8	1.02
Columbus†	104	66	84.4	4.35	Shelbina	100	56	80.8	1.02
Corinth†	94	54	77.2	8.73	Shelbina	100	56	80.8	1.02
Edward†	98	70	82.4	5.90	Shelbina	100	56	80.8	1.02
Fayette†	98	68	82.4	4.68	Shelbina	100	56	80.8	1.02
Greenville	92	68	80.6	4.16	Shelbina	100	56	80.8	1.02
Hazlehurst†	96	64	81.0	1.50	Shelbina	100	56	80.8	1.02
Hernando*	95	55	81.6	2.07	Shelbina	100	56	80.8	1.02
Holly Springs (1)*	93	66	80.2	3.64	Shelbina	100	56	80.8	1.02
Holly Springs (2)†	96	64	81.0	3.50	Shelbina	100	56	80.8	1.02
Jackson†	96	66	81.4	3.14	Shelbina	100	56	80.8	1.02
Kosciusko†	91	66	77.2	4.00	Shelbina	100	56	80.8	1.02
Lake†	96	64	80.5	7.39	Shelbina	100	56	80.8	1.02
Lamar*	94	70	82.4	2.75	Shelbina	100	56	80.8	1.02
Loch Leven	94	70	82.4	2.75	Shelbina	100	56	80.8	1.02
Logtown	94	70	82.4	2.75	Shelbina	100	56	80.8	1.02
Louisville†	100	66	81.2	9.27	Shelbina	100	56	80.8	1.02
Macon (1)†	94	56	80.2	7.00	Shelbina	100	56	80.8	1.02
Macon (2)†	100	66	82.8	3.06	Shelbina	100	56	80.8	1.02
Meridian†	104	68	82.8	4.91	Shelbina	100	56	80.8	1.02
Natchez†	104	68	82.8	4.91	Shelbina	100	56	80.8	1.02
Okeola†	98	63	81.5	4.10	Shelbina	100	56	80.8	1.02
Pearl River†	94	73	83.1	6.14	Shelbina	100	56	80.8	1.02
Port Gibson†	97	67	81.5	4.63	Shelbina	100	56	80.8	1.02
Pontotoc†	90	61	75.9	6.23	Shelbina	100	56	80.8	1.02
Rienzi*	93	66	79.8	7.43	Shelbina	100	56	80.8	1.02
Summit†	93	66	75.0	9.96	Shelbina	100	56	80.8	1.02

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Nebraska—Cont'd.</i>					<i>New Mexico—Cont'd.</i>				
Crane's Ranch	105	52	79.4	0.00	Gallinas Spring†	95	60	78.0	1.47
Downeyville	105	52	79.4	0.00	Hillsborough†	100	57	76.6	4.19
El Dorado	107	56	73.3	2.32	Las Vegas†	97	48	72.0	4.30
Elko (1)*	107	56	73.3	0.00	Lordsburg*	105	70	85.2	1.70
Elko (2)	108	56	73.0	0.00	Los Lunas†	101	56	78.6	0.21
Ely	99	48	74.0	0.00	Nogal	95	56	75.0	2.39
Eureka	106	44	74.5	0.01	Red Cañon	95	56	75.0	1.26
Fenelon*	104	51	75.3	0.00	Springer†	95	56	75.0	3.71
Ferguson's Ranch	104	51	75.3	0.00	<i>New York.</i>				
Genoa	98	44	69.6	0.00	Alfred Centre	86	45	65.8	4.47
Golconda*	104	67	82.1	0.00	Angelica†	88*	44	67.4	5.00
Hallock*	110	59	77.8	0.00	Arcade*	91	42	67.1	4.65
Hawthorne (1)*	106	66	84.5	0.00	Ardens*	88	61	71.2	9.28
Hawthorne (2)	102	55	77.4	0.10	Auburn	88	52	69.6	7.66
Hot Springs (1)*	115	60	81.5	0.00	Boyd's Corners*	90	61	72.8	7.19
Hot Springs (2)*	115	60	79.4	0.00	Canton†	92*	50	68.1	8.25
Humboldt (1)*	106	58	75.7	0.00	Conestableville†	88	50	67.4	7.13
Humboldt (2)	106	58	72.8	0.00	Cooperstown*	85	53	66.9	5.61
Lewer's Ranch	100	42	74.8	T.	Coopers Island	90	51	71.1	13.12
Mill City	116	57	79.0	0.00	Eden	90	56	73.6	4.43
Palisade*	110	60	77.8	0.00	Elmira†	90	53	73.2	3.08
Pioche	104	48	74.6	0.79	Factoryville†	88	45	69.0	5.59
Punch Bowl	94	49	70.9	0.00	Fleming	92	52	69.7	7.00
Reno*	102	57	77.4	0.00	Fort Columbus	91	56	73.8	8.79
Reno, State Univ'ty	100	45	74.4	0.00	Fort Hamilton	87	62	72.1	7.54
Ruby Hill	90	40	67.7	T.	Fort Niagara	83	56	72.7	2.08
Saint Clair	103	54	75.6	0.00	Fort Porter	88	51	70.2	3.58
Sodaville	109	57	81.8	0.00	Fort Schuyler	88	57	72.1	10.09
Tecoma*	104	60	82.7	0.00	Fort Wadsworth	92	54	73.8	8.28
Toano	93	56	82.5	0.00	Geneva	95	45	70.6	5.31
Tuescarora	98	37	68.0	T.	Hess Road Sta.†	91	42	70.1	8.09
Verdi	105	57	73.9	0.00	Honeyhead Brook	88	48	68.1	8.99
Virginia City	99	52	76.6	0.00	Humphrey*†	87	53	69.4	3.08
Wadsworth	106	65	83.9	0.00	Ilion†	92	47	68.8	6.86
Wells*	105	52	80.3	0.27	Ithaca	90	50	70.2	7.73
Winnebago*	102	58	79.3	0.00	Kingston†	95	44	73.2	9.05
<i>New Hampshire.</i>					Lyons	92	53	70.7	6.03
Belmont	97	33	64.1	4.64	Madison Barracks	90	39	67.0	3.91
Berlin Falls	97	33	64.1	4.64	Middleburgh†	91	44	69.9	4.45
Berlin Mills	92	57	72.2	5.00	Newfane Station*	91	64	74.0	6.25
Bristol	92	57	72.2	5.00	Nineveh*	90	56	70.2	6.25
Concord	85	51	67.8	5.63	North Hammond*	94	57	72.4	4.08
Hanover	89	48	69.5	5.48	Number Four†	84	40	64.6	5.03
Lake Village	106	48	68.6	3.86	Palermo†	87	47	68.4	3.61
Manchester (1)	86	48	68.6	6.65	Palmyra*	92	60	72.0	6.00
Manchester (2)	87	51	69.1	6.14	Pendleton Centre*	91	60	69.6	6.00
Mine Falls	88	50	68.7	7.00	Perry City*	91	50	67.6	7.71
Nashua*	88	50	68.7	7.00	Plattsburgh B'ks	86	50	69.3	5.62
Newton	86	49	67.6	7.09	Potsdam	89	52	70.2	7.87
North Chesterfield	87	40	63.9	7.35	Queensbury*†	80	60	69.2	5.08
North Conway	86	42	66.6	6.02	Rome	92	52	69.2	6.56
North Sutton*	86	54	65.6	4.85	Savona†	90	43	69.2	5.44
Pennichuck Sta.	92	42	67.8	5.03	Setauket*	86	58	71.4	6.64
Plymouth	92	42	67.8	4.67	Somerset*	86	62	71.2	6.00
Shaker Village	84	47	61.0	5.44	South Canisteo*	86	53	67.6	9.25
Stratford	96	40	69.1	4.00	South Kortright*†	90	50	65.4	5.52
Walpole	84	49	65.3	7.40	Tannersville†	80	40	66.2	10.20
West Milan	86	40	63.0	4.64	Utica	100	48	73.5	6.10
Weir's Bridge	92	42	67.8	3.23	Waterveil Arsenal	88	51	70.3	5.55
Wolfborough	92	42	67.8	5.11	Wedgewood*	93	52	70.4	7.10
<i>New Jersey.</i>					West Point	89	50	70.7	9.94
Allaire	88	52	71.6	.....	White Plains*	85	58	70.9	14.07
Asbury Park	93	55	71.5	8.35	Willet's Point	86	58	71.9	7.13
Beverly†	90	58	72.8	7.28	<i>North Carolina.</i>				
Billingsport L. H.	92	64	76.7	7.66	Asheville (1)†	91	57	72.9	5.39
Brigdeton	92	67	76.6	7.66	Asheville (2)	91	57	72.9	5.39
Cape May C. H.	90	57	72.8	.....	Belwood*	91	66	75.2	6.95
Egg Harbor City	89	54	72.9	7.08	Charleston*	92	62	76.8	7.3
Freehold	88	52	72.1	9.89	Goldsborough†	98	62	76.8	7.3
Gillette	93	51	72.1	12.31	Grover*	97	64	78.2	3.08
Hanover	89	48	71.3	11.83	Lenoir*	87	63	74.0	9.00
Highland Park	89	54	73.0	10.59	Lumberton†	98	62	79.6	8.05
Hopewell	91	55	73.0	9.06	Mount Holly†	94	62	76.5	7.84
Imlaystown	89	60	72.4	10.33	Mount Pleasant	94	62	76.5	8.26
Lambertville	94	53	73.8	13.06	Murphy†	94	58	77.2	7.11
Locktown	90	51	72.1	12.47	New Bern†	94	58	77.2	8.44
Madison	92	57	72.7	7.94	Soapstone Mount*	96	64	75.4	10.00
Moorestown*	88	59	74.0	14.60	Wadsworth†	96	50	77.8	9.96
Newark	88	59	74.0	14.60	Weldon (1)†	96	50	77.8	8.59
New Brunswick (1)	87	61	73.5	10.45	Weldon (2)†	98	54	77.8	11.91
New Brunswick (2)	88	54	73.5	10.35	<i>Ohio.</i>				
New Brunswick (3)	88	54	74.2	.....	Akron	90	49	71.5	2.42
Ocean City	91	62	74.0	5.40	Ashland	92	52	72.8	4.23
Oceanic	93	59	74.6	8.60	Athens	92	52	72.8	7.70
Plainfield	92	55	71.9	15.52	Bangorville	93	52	70.5	3.82
Princeton	91	55	73.0	8.78	Beaflaville*	95	58	75.0	.....
Rancocas	90	60	72.0	7.81	Bellevue*	92	58	70.3	2.16
Reading*	96	64	77.0	.....	Caledonia†	92	58	70.3	6.80
South Orange	90	53	70.9	18.58	Canton (2)	94	50	72.6	7.34
Tenafly	93	48	71.3	15.53	Carrollton*	92	60	72.4	3.39
Tom's River	88	53	73.2	4.90	Celina	89	53	72.2	3.93
Trenton	92	64	77.0	9.86	Circleville (1)†	92	58	72.2	5.63
Union	86	57	71.3	14.65	Circleville (2)	92	58	72.2	5.74
Valley	95	61	73.5	11.21	Clarksville	92	54	73.0	2.25
Woodbury	92	61	73.5	10.02	Cleveland	92	52	70.9	2.65
<i>New Mexico.</i>					College Hill*	93	64	77.4	5.85
Albuquerque	100	58	78.3	0.77	Collinwood*	94	51	74.0	2.80
Coolidge	100	48	73.2	3.20	Columbus Barracks	98	54	76.2	3.11
Deming*	110	70	86.7	0.91	Dayton	88	58	69.9	4.05
Fort Bayard	95	56	73.3	0.61	Demos*	92	50	72.1	2.07
Fort Marey	94	50	71.3	1.01	Ellsworth	95	50	72.1	3.19
Fort Selden	109	67	83.6	0.59	Elyria	93	49	74.6	4.35
Fort Stanton	93	48	69.7	1.75	Forstoria	93	49	74.6	5.17
Fort Union	90	42	63.3	2.73	Gallipolis	91	43	68.0	1.69
Fort Wingate	90	42	63.3	2.73	Garrettsville	91	43	68.0	1.69



## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
<b>Ohio—Cont'd.</b>					<b>Pennsylvania—Con.</b>				
Georgetown.....	96	54	74.6	4.58	Petersburg.....	97	49	70.1	5.47
Granville.....	92	53	72.3	3.76	Phillipsburg f.....	94	48	69.4	5.21
Greenville.....	86	54	71.7	4.31	Pleasant Mount*.....	55	55	69.6	7.59
Hanging Rock.....	93	56	72.8	5.93	Point Pleasant.....	92	56	74.4	12.30
Hiram.....	89	53	71.1	2.35	Pottstown.....	92	48	70.8	11.54
Jacksonborough.....	93	61	76.1	2.45	Quakertown.....	92	50	73.6	9.30
Jefferson.....	88	49	67.9	4.10	Reading f.....	92	56	75.0	6.74
Kent.....	93	50	72.4	3.49	Rimersburg.....	84	49	67.2	3.03
Kenton f.....	92	55	70.2	4.59	Salem Corners.....	89	57	74.4	4.29
Leipsic.....	94	62	78.0	10.83	Seisholtzville.....	89	45	68.5	5.06
Logan.....	97	52	72.0	2.35	Selins Grove.....	90	57	70.9	4.68
Lordstown.....	92	42	70.8	3.96	Smith's Corners.....	91	56	73.0	8.74
Mansfield.....	90	56	74.2	9.50	Somerset.....	95	50	69.4	6.91
Marietta (2) f.....	95	54	73.4	4.22	Tuscarora*.....	86	63	76.4	6.95
McConnellsville.....	90	53	74.3	4.95	Uniontown.....	99	52	74.0	4.81
Napoleon f.....	92	52	72.0	4.84	Warren f.....	90	42	68.6	5.42
New Alexandria.....	96	51	75.6	6.23	Wellsborough*.....	90	55	73.0	12.57
New Athens f.....	94	50	72.6	4.91	West Chester.....	91	44	69.2	5.17
New Comerstown.....	90	55	70.7	3.25	Wysox.....	95	52	74.5	4.34
North Lewisburgh.....	90	51	74.8	2.18	<b>Rhode Island.</b>				
Oberlin.....	92	49	73.0	2.68	Bristol.....	86	52	69.2	6.63
O. S. University.....	86	52	70.6	1.80	Fort Adams.....	89	52	67.9	5.28
Orangeville*.....	90	50	70.6	1.74	Kingston (1).....	86	51	67.9	8.70
Ottawa f.....	50	69.9	7.05	7.71	Kingston (2).....	89	50	65.7	8.70
Poland*.....	96	55	77.5	7.05	Lonsdale.....	82	56	68.8	9.90
Pomeroy.....	94	56	73.9	7.56	Newport.....	89	55	72.8	10.68
Portsmouth (1) f.....	93	62	74.0	3.40	Olneyville.....	90	54	71.2	9.49
Portsmouth (2) f.....	94	56	73.9	3.35	Pawtucket.....	86	53	70.6	11.41
Shanewille*.....	90	49	67.6	3.40	<b>South Carolina.</b>				
Shiloh*.....	95	50	74.1	3.40	Allendale f.....	98	70	81.6	6.16
Sidney f.....	91	50	72.8	2.23	Batesburg f.....	98	60	77.8	9.08
Springborough.....	92	49	72.6	3.35	Beaufort f.....	95	76	85.6	4.72
Tiffin.....	95	51	70.8	2.34	Belmont.....	93	64	78.5	6.23
Upper Sandusky.....	98	49	76.0	5.44	Blackville f.....	100	64	81.4	6.52
Vienna*.....	93	46	71.4	4.82	Branchville f.....	96	56	79.9	5.53
Wapakoneta.....	94	59	76.0	5.44	Brewer Mine.....	99	55	77.0	7.58
Waynesville.....	92	52	71.2	3.89	Cedar Springs f.....	95	51	76.6	8.33
West Milton*.....	98	58	76.4	5.85	Cheraw f.....	98	62	81.0	10.89
Weymouth.....	92	48	70.0	6.73	Chester f.....	100	63	80.3	5.67
Wooner f.....	90	54	72.6	2.07	Clinton.....	95	66	80.5	3.23
Yellow Springs.....	92	51	72.5	1.83	Columbia Ex. St.....	96	64	80.0	9.26
Youngstown.....	90	51	72.5	1.83	Conway.....	93	68	80.5	10.31
<b>Oregon.</b>					Evergreen.....	94	62	78.0	6.27
Albany f.....	96	48	69.9	0.00	Florence f.....	100	64	81.6	5.89
Ashland*.....	97	60	78.9	1.25	Greenville f.....	94	40	78.3	7.99
Bandon.....	71	50	57.7	0.17	Greenwood f.....	102	64	80.0	6.81
East Portland.....	96	52	74.0	0.00	Hardeeville f.....	98	70	82.3	9.83
Eola*.....	94	56	70.3	0.00	Jacksonborough f.....	98	64	74.8	5.89
Fort Klamath.....	98	25	64.6	0.27	Kingstree f.....	96	62	79.6	6.82
Grant's Pass f.....	104	40	75.4	0.00	Kirkwood*.....	65	75.8	9.95	6.91
Heppner f.....	101	42	72.3	0.12	Port Royal.....	95	74	80.7	4.72
La Grande.....	95	41	70.6	0.33	Saint Georges f.....	98	64	80.6	6.83
Mount Angel f.....	96	44	71.5	0.00	Saint Matthews f.....	96	64	80.0	9.38
Parkers.....	99	53	74.3	0.85	Simpsonville.....	93	67	78.7	5.09
Shikyu.....	85	53	61.1	0.14	Sparksburg (2) f.....	104	50	74.4	3.47
<b>Pennsylvania.</b>					Sparksburg f.....	92	64	77.9	6.27
Alliaghery Arsenal.....	94	53	74.4	5.52	Timmons ville.....	90	72	81.0	2.70
Altoona.....	93	55	74.6	4.60	Trial.....	96	63	79.5	5.54
Aqueduct*.....	96	60	75.0	5.86	Walhalla.....	87	70	78.5	8.20
Bethlehem.....	94	54	74.0	9.93	Winnabowh.....	95	62	78.5	6.16
Blooming Grove*.....	92	58	71.2	11.00	Yorkville.....	94	61	77.5	7.29
Blae Knob.....	94	49	71.5	6.20	<b>Tennessee.</b>				
Brookville f.....	91	52	72.6	6.62	Andersonville.....	89	57	75.4	6.34
Catawissa.....	96	48	70.4	4.19	Arlington f.....	96	60	77.9	3.80
Charlestown.....	94	52	72.9	12.93	Ashwood f.....	90	62	77.0	9.02
Clairton f.....	94	52	72.9	12.93	Austin f.....	92	62	79.3	5.76
Coatesville.....	88	42	68.1	2.00	Bolivar (1).....	96	60	78.7	3.50
Conneaut f.....	88	50	67.1	9.55	Bolivar (2) f.....	95	60	79.2	3.52
Corry.....	88	50	67.1	9.55	Brownsville f.....	98	62	82.6	4.34
Drifton f.....	89	42	65.8	6.53	Charleston f.....	90	60	77.8	3.01
Doylstown.....	86	51	67.5	6.30	Clarksburg.....	90	60	77.8	3.01
Dyberry f.....	86	52	67.5	10.48	Clinton f.....	90	60	77.8	3.01
Eagle's Mere.....	87	50	71.2	10.48	Columbia f.....	90	60	77.8	3.01
Easton*.....	87	50	71.2	10.48	Covington (1).....	89	68	78.0	5.43
Edinborough*.....	93	41	70.0	7.03	Covington (2) f.....	97	58	79.5	4.78
Emporium.....	93	41	70.0	7.03	Cumberland Gap.....	88	55	73.4	7.24
Falls of Neeshaminy.....	90	52	67.6	8.86	Dunlap.....	94	64	77.1	6.47
Franklin.....	95	57	74.5	9.59	Dyersburg f.....	100	59	81.4	5.92
Frederick.....	95	57	74.5	9.59	Fayetteville.....	95	65	77.2	6.86
Freeport f.....	94	52	72.9	12.93	Florence Station.....	88	67	76.7	6.48
Germantown.....	88	60	73.6	10.50	Postoria.....	86	61	70.3	9.04
Gettysburg.....	90	53	72.6	9.46	Grand Junction f.....	93	62	79.0	6.33
Girardville.....	94	52	70.8	7.33	Grief.....	94	65	77.8	3.87
Grampian Hills.....	95	45	68.8	1.04	Greenville.....	86	62	73.2	5.45
Greensborough f.....	95	47	71.6	6.22	Hohenwald.....	97	56	75.7	8.53
Greenville.....	86	44	66.4	15.02	Jacksborough.....	88	63	75.7	4.45
Holidaysburgh.....	93	50	70.0	8.33	Johnsonville f.....	90	60	77.8	3.01
Honesdale.....	93	50	70.0	8.33	Kingston (1) f.....	93	65	79.8	2.96
La Dale.....	90	48	68.8	6.40	Kingston (2).....	93	65	79.8	2.96
Le Roy.....	94	40	72.7	6.08	Kingston Springs.....	93	65	79.8	2.96
Lock No. 4 f.....	94	40	72.7	6.08	Levitt.....	90	63	78.3	3.80
Mahoning f.....	94	40	72.7	6.08	Lewisburgh.....	91	65	76.6	8.50
McConnellsburch.....	94	40	72.7	6.08	Lookout Mountain f.....	84	66	74.6	3.01
Headville (1) f.....	94	40	72.7	6.08	London f.....	92	66	79.9	5.88
Mashoppen*.....	94	40	72.7	6.08	McKenzie.....	86	59	73.9	5.23
New Bloomfield.....	94	40	72.7	6.08	McMinnville.....	86	59	73.9	5.23
Sisbet*.....	94	40	72.7	6.08	Milan (1).....	92	62	77.0	4.00
Oil City f.....	94	40	72.7	6.08					
Ottsville.....	94	40	72.7	6.08					
Parker's Landing f.....	94	40	72.7	6.08					

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
<b>Tennessee—Cont'd.</b>					<b>Utah—Cont'd.</b>				
Milan (2) f.....	96	60	80.0	4.32	Terrace*.....	104	67	85.0	0.00
Mont Eagle.....	87	64	75.0	5.27	<b>Vermont.</b>				
Nunnally.....	93	58	75.1	7.98	Brattleborough (1).....	88	47	69.6	8.20
Parksville.....	91	62	75.2	3.96	Brattleborough (2).....	84	50	67.0	.....
Riddleton.....	89	59	76.3	9.59	Burlington.....	88	52	70.2	4.09
Rockwood f.....	93	68	77.4	5.35	Chelsea*.....	76	54	63.2	5.05
Rogersville f.....	89	62	74.3	6.27	Cornwall.....	92	42	67.3	3.68
Rugby.....	92	62	78.2	5.30	East Berkshire f.....	88	42	67.3	3.68
Savannah.....	94	60	77.6	6.77	Jacksonville.....	86	54	66.8	9.70
Springdale.....	88	59	76.3	2.69	Lunenburg.....	92	50	68.4	5.37
Strawberry Plains f.....	87	65	76.9	4.99	Manchester*.....	86	54	68.6	8.38
Trenton.....	97	68	78.8	1.66	Newport*.....	89	57	69.6	0.95
Tullahoma.....	85	61	75.3	8.82	Saint Johnsbury.....	82	44	65.0	4.48
Watkins.....	90	61	75.3	3.15	Stratford.....	82	54	68.3	6.50
Waynesborough.....	90	61	75.3	3.15	Vernon*.....	94	56	69.7	11.02
Woodstock.....	90	61	75.3	3.15	<b>Virginia.</b>				
<b>Texas.</b>					Abingdon f.....	88	60	71.2	8.09
Austin (1).....	99	72	84.4	3.93	Alum Springs.....	88	60	71.2	8.09
Austin (2).....	96	72	82.6	3.93	Bird's Nest.....	90	67	78.6	8.40
Baird*.....	70	80.6	1.63	3.7	Bolar*.....	37	50	65.6	5.50
Belton f.....	103	70	84.3	1.52	Christiansburg.....	92	54	72.6	4.88
Brady f.....	97	65	79.4	4.33	Dale Enterprise f.....	103	54	75.2	6.66
Brazoria f.....	93	70	81.1	4.50	Fort Monroe.....	92	65	77.8	11.61
Brenham f.....	101	72	85.0	2.49	Fort Myer.....	95	55	75.1	8.28
Brownwood f.....	101	66	82.6	3.76	Lexington.....	92	49	71.2	8.75
Camp Eagle Pass.....	101	69	84.8	5.55	Mossingford.....	90	60	76.0	4.40
Cp Peña Colorado.....	102	59	79.4	2.63	Petersburg f.....	90	61	75.3	8.55
Cedar Hill*.....	99	69	83.1	9.00	Smithfield*.....	90	58	76.2	7.05
Cleburne.....	94	76	82.6	11.50	Spottsville.....	90	52	74.7	.....
Coldwater.....	104	71	85.8	2.47	Summit.....	90	52	74.7	.....
College Station.....	96	72	83.2	3.46	University of Va.....	90	52	74.7	12.05
Columbia Station f.....	96	72	83.2	3.46	<b>Washington Territory.</b>				
Corsicana (1).....	98	68	82.6	2.68	Blakeley f.....	91	45	64.5	0.26</



## Reports received too late for publication in June.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Arizona.	0	0	0	Ins.	New York.	0	0	0	Ins.
Lochiel.	101	54	80.8	0.85	Honeymead Brook.	87	38	66.0	3.40
Winslow.	101	54	80.8	0.85	Pennsylvania.	91	48	68.0	6.70
California.	95	36	63.9	0.00	Blooming Grove.	91	48	68.0	6.70
Boca.	88	58	68.5	0.00	Tennessee.	93	61	77.7	9.40
Pleasanton.	87	61	70.6	0.00	Bolivar (2).	88	60	73.5	8.76
San Pedro.	87	61	70.6	0.00	Texas.	84	83	83.8	4.19
Shingle Springs.	87	61	70.6	0.02	Baird.	92	72	79.5	12.52
Missouri.					West Indies.				
Booneville.				2.92	Grand Turk Is'd.				
New Mexico.					South America.				
Albuquerque.	95	47	70.1	0.53	Colony of Surinam.				
Nogal.				2.72	Burnside-Corone.				

\* Maximum and minimum from observed readings. † From one observation at 10 a. m.

## Precipitation (inches and hundredths) observed at Fort Benton, Mont., by assistant surgeons, U. S. Army, and Signal Service observers.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1869	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1870	1.00	0.42	0.15	0.06	2.41	0.63	0.80	0.71	0.32	0.41	0.14	0.22	7.27
1871	0.50	0.38	0.48	1.48	1.58	0.11	0.93	0.10	0.46	0.71	0.65	1.30	8.68
1872	0.27	0.34	0.82	0.67	0.64	1.14	4.62	0.61	1.82	0.19	0.61	0.59	12.32
1873	0.60	0.65	0.23	1.14	3.03	1.67	1.29	1.59	0.58	0.19	0.86	0.12	11.95
1874	0.67	0.10	0.64	0.43	2.98	2.13	0.10	1.17	0.49	0.56	0.58	0.60	10.45
1875	0.66	1.11	0.22	1.02	1.60	2.57	2.24	1.19	0.13	0.71	0.85	0.43	12.75
1876	0.71	0.28	1.53	1.25	11.06	1.45	2.31	1.46	0.39	0.24	0.33	0.09	21.10
1877	0.72	0.11	0.60	1.04	4.58	1.44	1.94	0.80	0.90	0.43	0.45	0.00	13.01
1878	0.20	0.05	0.30	3.24	5.25	2.26	1.31	0.16	2.32	1.18	0.09	0.50	16.86
1879	0.22	0.74	0.14	1.36	4.06	4.98	1.98	1.56	0.18	0.60	0.06	1.40	17.30
1880	0.24	0.64	0.36	1.80	1.54	4.50	1.12	1.56	0.32	1.09	1.44	1.39	16.00
1881	0.27	0.66	0.29	1.81	1.43	3.46	2.28	1.18	1.32	1.94	1.73	0.07	16.81
1882	0.75	0.38	1.09	1.22	0.35	0.13	0.85	0.27	2.89	0.86	0.39	1.00	10.18
1883	0.75	0.45	1.34	1.02	3.31	1.93	0.16	1.01	0.93	1.64	0.36	0.11	13.01
1884	0.56	0.48	0.61	1.23	1.09	2.18	3.09	0.79	1.44	0.36	0.29	1.01	13.13
1885	0.94	0.60	0.64	0.64	0.48	5.60	2.82	1.81	0.25	0.37	0.65	0.38	14.94
1886	0.67	0.65	0.70	2.01	0.36	1.53	0.90	0.66	1.24	.....	.....	.....	.....
Mean	0.69	0.47	0.58	1.16	2.69	2.22	1.69	0.98	0.94	0.72	0.57	0.59	13.30

\* Interpolated, and not considered in the averages.

## Precipitation (inches and hundredths) observed at Camp Date Creek, Ariz., by assistant surgeons, U. S. Army.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1867	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1868	3.12	2.27	1.55	1.40	0.93	0.00	7.24	8.30	0.93	0.70	0.75	0.95	27.84
1869	2.01	2.85	2.30	1.39	0.00	1.49	2.18	4.67	T.	T.	1.90	1.15	20.59
1870	0.29	0.70	1.06	T.	T.	T.	5.70	3.12	0.00	0.50	0.33	1.00	.....
1871	0.10	1.00	1.00	1.00	0.04	0.00	2.17	0.84	0.62	0.44	T.	0.06	6.47
1872	T.	0.80	T.	2.05	0.00	0.07	1.86	4.55	0.00	0.07	0.00	1.15	10.55
1873	0.00	1.86	0.24	0.04	0.08	0.11	0.36	*1.04	.....	.....	.....	.....	.....
Mean	0.92	1.58	0.95	1.22	0.12	0.24	3.19	3.78	0.39	0.46	0.64	1.40	16.34

\* 12 days.

## Precipitation (inches and hundredths) observed at Pantano, Ariz., by Southern Pacific Railroad Company.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1880	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1881	0.08	0.00	1.22	0.73	0.60	0.00	4.52	2.72	3.30	2.48	0.00	0.00	15.65
1882	2.12	2.80	0.65	0.00	0.60	0.00	1.77	5.74	0.00	0.53	1.15	0.00	15.73
1883	1.84	0.41	1.61	0.00	0.45	0.00	1.77	2.06	0.06	0.53	0.05	0.19	.....
1884	0.31	1.04	0.73	0.00	0.34	0.00	0.40	2.60	1.45	2.80	0.85	4.70	.....
1885	0.00	1.10	0.78	0.05	0.20	0.99	1.57	1.63	2.08	0.00	0.00	0.56	8.96
1886	1.40	1.07	0.85	0.30	0.00	0.00	1.00	2.54	2.24	0.46	0.50	0.00	10.36
1887	0.00	1.15	0.00	0.00	0.00	0.31	1.86	2.66	1.38	0.38	0.50	1.19	.....
1888	0.00	1.42	0.02	0.02	0.25	.....	.....	.....	.....	.....	.....	.....	.....
Mean	0.72	1.08	0.91	0.14	0.33	0.44	1.84	2.85	1.50	0.83	0.54	0.87	12.68

## Precipitation (inches and hundredths) observed at Fort Defiance, Ariz., by assistant surgeons, U. S. Army.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1882	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1883	0.40	0.08	1.29	0.10	1.44	0.43	1.43	4.65	2.64	0.94	0.22	0.25	13.87
1884	2.20	0.15	0.45	0.93	1.51	1.24	3.94	5.24	3.47	0.62	1.49	1.20	22.44
1885	0.83	1.71	3.30	0.51	0.10	0.43	1.54	.....	2.86	0.00	1.47	1.59	.....
1886	0.82	1.54	0.54	0.78	0.33	0.10	2.14	3.07	1.75	0.00	0.18	0.40	11.63
1887	0.20	0.67	0.00	0.51	0.04	0.45	1.30	1.78	1.01	1.73	4.30	1.07	13.06
1888	0.54	0.54	0.59	1.04	0.00	0.27	2.22	3.32	0.95	0.28	0.28	1.31	11.97
1889	0.02	0.77	0.41	0.85	0.39	0.63	2.72	2.17	1.79	0.30	.....	0.23	.....
1890	2.86	0.12	0.13	0.02	0.00	.....	5.77	0.30	0.49	0.80	0.15	0.43	.....
Mean	0.98	0.70	0.84	0.67	0.52	0.74	2.44	2.73	1.86	0.70	1.16	0.67	14.59

## Normal daily temperature values for certain months for a period of seventeen years at New Ulm, Tex., and the departures therefrom for the same months of the year 1889, by C. Runge, voluntary observer.

Date.	January.					February.				
	Normal.	Mean 1889.	Departure from normal.	Mean maximum.	Mean minimum.	Normal.	Mean 1889.	Departure from normal.	Mean maximum.	Mean minimum.
1.	46	40	-6	67	28	53	50	-3	71	39
2.	49	46	-3	68	31	53	49	-4	72	38
3.	48	45	-3	69	28	49	51	+2	70	33
4.	47	47	0	67	28	50	56	+6	70	19
5.	45	49	+4	71	20	51	47	-4	69	23
6.	49	54	+5	72	28	53	49	-4	66	32
7.	50	58	+8	72	29	55	53	-2	70	38
8.	42	51	+9	71	17	57	63	+6	70	43
9.	43	43	0	68	19	57	52	-5	72	48
10.	46	53	+7	72	26	58	56	-2	74	28
11.	50	54	+4	72	24	56	55	-1	71	34
12.	52	60	+8	64	25	56	52	-4	71	34
13.	51	66	+15	65	30	55	58	+3	72	29
14.	50	66	+16	60	28	57	67	+10	72	29
15.	51	68	+17	68	12	54	69	+15	73	39
16.	48	58	+10	69	18	57	72	+15	72	41
17.	46	57	+11	70	28	58	64	+6	69	39
18.	48	49	+1	68	33	56	42	-14	72	38
19.	49	56	+7	70	27	58	45	-13	73	44
20.	52	43	-9	71	16	56	44	-12	74	44
21.	53	43	-10	72	23	55	50	-5	64	40
22.	52	48	-4	73	32	57	54	-3	67	40
23.	49	56	+7	72	31	59	50	-9	73	41
24.	48	50	+2	60	22	59	51	-8	72	42
25.	54	49	-5	66	30	59	62	+3	70	45
26.	57	43	-14	71	37	58	63	+5	70	47
27.	58	41	-17	71	42	58	63	+5	74	46
28.	55	44	-11	72	17	60	64	+4	71	42
29.	54	55	+1	71	20	.....	.....	.....	.....	.....
30.	56	58	+2	70	33	.....	.....	.....	.....	.....
31.	57	52	-5	72	42	.....	.....	.....	.....	.....
Mean	50	51	+1	70	27	56	55	-1	71	37

	March.					April.				
1.	61	54	- 7	70	48	64	64	0	70	48
2.	59	46	-13	71	46	65	69	+ 4	74	56
3.	60	55	- 5	73	45	67	61	+ 6	77	58
4.	62	56	- 6	75	46	66	65	+ 1	78	47
5.	63	52	-11	75	45	67	72	+ 5	77	48
6.	60	51	- 9	75	42	70	69	- 1	78	54
7.	59	60	+ 1	71	41	69	68	- 1	77	78
8.	60	63	+ 3	70	42	65	69	+ 4	79	45
9.	61	61	0	72	47	67	69	+ 2	79	49
10.	62	49	-13	73	48	69	70	+ 1	78	57
11.	62	52	-10	74	42	70	72	+ 2	76	61
12.	61	52	- 9	73	46	67	72	+ 5	76	53
13.	63	60	- 3	72	46	66	66	0	76	51
14.	64	61	- 3	74	31	68	67	- 1	76	56
15.	64	71	+ 7	76	34	69	72	+ 3	80	35
16.	64	72	+ 8	75	40	69	73	+ 4	78	60
17.	61	68	+ 7	76	41	70	71	+ 1	78	56
18.	62	66	+ 4	74	46	70	72	+ 2	76	59
19.	64	63	- 1	76	49	70	71	+ 1	76	62
20.	60	66	+ 6	75	38	70	73	+ 3	77	47
21.	61	66	+ 5	74	46	71	68	- 3	77	49
22.	61	60	- 1	73	44	69	71	+ 2	75	59
23.	62	52	-10	70	49	68	73	+ 5	77	51
24.	63	54	- 9	72	45	67	74	+ 7	77	39
25.	64	58	- 6	72	44	69	75	+ 6	75	56
26.	65	64	- 1	76	43	71	76	+ 5	79	59
27.	65	54	-11	76	48	72	72	0	77	64
28.	65	63	- 2	76	47	72	73	+ 1	78	60
29.	65	67	+ 2	79	44	71	74	+ 3	79	59
30.	68	68	0	80	46	69	57	-12	78	57
31.	67	70	+ 3	76	57					
Mean	63	60	- 3	74	44	69	70	- 1	77	54



Table of miscellaneous meteorological data for July, 1889—Signal Service observations.

Stations and districts.	Elevation above level, feet.	Pressure, in inches.			Temperature of air, in degrees Fahrenheit.										Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal precipitation.	Wind.					Total movement, miles.	Prevailing direction.	Miles per hour.	Direction.	Date.	Cloudless days.	Partly cloudy days.	Cloudy days.	Days with rainfall.	Average cloudiness, tenths.	Length of record, years.	Temperature data since opening of station.					
		Mean actual.	Mean reduced.	Monthly range.	Monthly mean.	Departure from normal.	Maximum.	Mean maximum.	Minimum.	Mean minimum.	Greatest daily range.	Least daily range.	Maximum velocity.	Direction.					Date.	Cloudless days.	Partly cloudy days.	Cloudy days.	Days with rainfall.												Average cloudiness, tenths.	Length of record, years.	Absolute maximum.	Year.	Absolute minimum.	Year.
New England.																																								
Eastport.....	53	29.89	29.95	0.72	65.1	-1.6	76	67.4	50	54.0	22	7	53.9	82.4	3.69	-0.96	5,731	sw.	32	e.	28	6	8	17	13.5	0.4	5	17	87	1886	45	1882								
Green Mountain..	1541	28.31	29.95	0.52	66.0	-0.3	71	66.0	47	54.0	22	5	54.8	88.0	2.45	-0.96	5,650	sw.	32	sw.	29	2	11	10	12.4	6.5	0	17	71	1889	47	1889								
Portland.....	99	29.85	29.95	0.65	66.4	-0.2	80	73.1	52	59.6	27	4	59.5	82.2	3.10	-0.77	5,560	sw.	33	s.	20	7	9	15	13.5	0.5	1	18	97	1876	48	1886								
Manchester.....	247	29.72	29.98	0.64	68.6	-0.2	87	70.9	52	60.2	28	4	59.9	78.2	5.35	-0.35	3,643	nw.	18	sw.	29	7	11	13	14.5	0.5	9	93	1887	48	1886									
Mt Washington..	6279	23.89	29.98	0.66	47.4	-0.6	70	52.2	30	42.8	22	3	44.2	91.6	13.16	+2.27	20,555	nw.	69	nw.	16	1	8	22	21.2	0.2	7	18	72	1881	24	1886								
Mt Killington..	2605	29.05	29.98	0.48	54.0	-0.6	66	60.1	39	47.8	19	4	49.8	90.6	5.78	-0.58	8,187	sw.	48	sw.	29	5	6	8	12.5	1.4	8	66	1889	39	1886									
Northfield.....	871	29.04	29.95	0.64	65.0	-0.2	85	74.2	43	55.8	23	5	58.2	76.6	4.05	-0.55	5,552	sw.	30	n.	21	8	8	20	17.7	1.6	9	1	81	1887	41	1886								
Boston.....	125	29.85	29.99	0.62	69.4	-0.2	86	76.0	55	62.8	25	3	62.7	82.2	13.23	+5.81	7,318	sw.	36	sw.	30	13	10	13	13.5	0.5	6	19	101	1880	46	1874								
Nantucket.....	14	29.99	30.00	0.64	67.0	-0.2	79	72.5	57	61.5	18	3	63.2	87.6	2.92	-0.70	6,370	sw.	33	ne.	15	12	10	9	10.4	9.4	7	3	84	1887	51	1886								
Wood's Holl.....	22	29.99	30.01	0.61	67.5	-0.2	79	72.8	56	62.2	16	4	63.0	88.6	3.63	-0.40	9,090	sw.	36	sw.	10	10	10	11	12.5	0.5	2	12	90	1876	51	1879								
Block Island.....	26	29.98	30.01	0.61	67.6	-0.2	81	72.6	57	62.7	18	4	64.0	90.3	2.92	-0.70	9,161	sw.	36	ne.	15	7	10	14	12.5	0.5	2	9	88	1885	53	1886								
Narragansett Pier	22	29.99	30.01	0.61	67.5	-0.2	79	72.8	56	62.2	16	5	63.0	88.6	3.63	-0.40	9,090	sw.	36	sw.	10	10	10	11	12.5	0.5	2	12	90	1876	51	1879								
New Haven.....	107	29.88	29.99	0.63	70.0	-0.2	88	77.5	55	62.5	25	7	64.0	83.4	17.08	+12.33	5,311	sw.	29	s.	19	10	8	13	18.6	7.6	17	95	1876	50	1885									
New London.....	47	29.93	29.98	0.63	70.2	-0.2	86	75.9	55	63.9	21	3	63.6	82.0	6.91	-2.47	5,197	sw.	36	s.	20	8	11	12	15.6	9.6	10	93	1887	51	1879									
Mid. Atlantic States.																																								
Albany.....	85	29.88	29.97	0.61	72.5	-1.5	89	80.9	54	64.1	26	8	64.6	80.7	4.19	-0.02	5,561	se.	30	se.	29	2	17	12	16.5	7.6	1	16	97	1886	45	1876								
New York City....	135	29.80	29.99	0.59	73.5	-0.5	88	80.9	54	64.1	26	6	64.5	77.0	9.63	+5.13	6,312	se.	35	sw.	4	6	10	15	15.6	2.6	1	19	97	1876	55	1888								
Harrisburg.....	351	29.62	30.00	0.57	73.8	-0.2	92	81.8	57	65.8	26	7	65.5	77.8	8.68	-0.47	4,375	e.	23	*	7	14	10	18.5	4.5	6	2	92	1889	54	1888									
Philadelphia.....	117	29.88	30.00	0.59	73.3	-1.7	94	83.1	60	67.5	24	5	65.4	76.3	8.29	+3.88	7,217	nw.	33	sw.	30	6	9	16	17.6	4.6	1	100	100	*	50	1883								
Atlantic City.....	53	29.95	30.00	0.58	71.8	-0.2	88	76.5	56	67.0	24	2	66.7	86.8	4.66	-1.39	7,917	sw.	31	nw.	15	11	6	14	15.5	5.4	16	99	1880	53	1880									
Baltimore.....	70	29.90	29.98	0.56	76.6	-1.4	93	83.7	61	69.6	27	5	66.4	74.4	11.03	+6.25	3,948	sw.	24	n.	13	7	10	14	18.6	1.5	17	102	1887	50	1885									
Washington City..	112	29.88	30.00	0.56	75.8	-1.2	92	83.4	59	68.1	25	6	67.5	80.4	8.13	+3.58	4,410	sw.	26	nw.	4	10	10	11	15.6	2.2	17	103	1887	54	1885									
Lynchburg.....	658	29.32	30.02	0.48	76.2	-1.8	96	85.1	59	67.4	26	6	67.8	80.8	10.94	+7.68	2,329	sw.	30	nw.	11	4	12	15	18.6	1.6	19	102	1881	54	1885									
Norfolk.....	69	29.96	30.02	0.49	77.6	-1.4	98	84.8	63	70.4	26	6	68.9	80.2	10.60	+5.40	5,402	sw.	52	nw.	11	5	11	15	20.6	1.6	5	19	102	1887	58	1888								
S. Atlantic States.																																								
Charlotte.....	808	29.21	30.04	0.44	78.8	-0.2	96	88.0	64	69.5	28	9	69.7	83.1	8.17	+1.90	3,525	se.	20	se.	30	8	13	10	13.6	6.8	11	102	1887	56	1885									
Rattlers.....	11	30.04	30.06	0.43	77.8	-0.2	97	82.3	67	73.3	13	6	71.0	82.4	2.26	-4.20	8,475	se.	36	w.	13	15	7	9	16.4	6.5	1	92	1881	61	1885									
Kitty Hawk.....	375	29.63	30.02	0.44	77.5	-0.9	100	86.8	61	69.4	24	8	67.7	78.2	6.04	-0.57	2,164	sw.	36	se.	20	9	6	16	18.6	5.5	3	103	1887	59	1888									
Bethlehem.....	52	29.98	30.04	0.40	79.0	-0.4	91	85.1	66	74.1	22	3	72.6	85.1	11.10	+3.97	5,140	sw.	36	sw.	20	6	14	11	15.7	5.4	19	103	1879	60	1888									
Wilmington.....	52	30.00	30.05	0.31	81.4	-0.6	97	87.4	71	75.5	25	5	73.9	82.8	6.74	-0.45	6,936	sw.	26	nw.	14	7	8	16	15.5	7.7	1	17	104	1879	65	1886								
Charleston.....	52	30.00	30.05	0.31	81.4	-0.6	97	87.4	71	75.5	25	5	73.9	82.8	6.74	-0.45	6,936	sw.	26	nw.	14	7	8	16	15.5	7.7	1	17	104	1879	65	1886								
Columbia.....	183	29.86	30.05	0.38	82.0	-0.0	100	91.3	66	72.8	26	8	72.4	81.0	10.10	+5.28	2,597	se.	19	se.	17	9	8	14	13.6	4.5	17	104	1878	62	1885									
Augusta.....	87	29.96	30.04	0.28	81.0	-0.0	95	88.2	70	73.8	20	8	73.2	82.6	6.21	+1.06	5,219	sw.	24	sw.	27	6	11	14	15.6	6.7	19	105	1879	65	1885									
Savannah.....	43	30.02	30.07	0.28	81.9	-1.1	97	89.7	70	74.1	23	8	73.4	81.6	8.24	+2.04	5,265	sw.	28	s.	28	7	13	11	16.5	0.5	3	104	1879	68	*									
Jacksonville.....	43	30.02	30.07	0.28	81.9	-1.1	97	89.7	70	74.1	23	8	73.4	81.6	8.24	+2.04	5,265	sw.	28	s.	28	7	13	11	16.5	0.5	3	104	1879	68	*									
Florida Peninsula.																																								
Cedar Keys.....	22	30.05	30.07	0.26	81.4	-0.6	91	86.1	71	76.7	16	5	74.6	83.0	10.03	+0.94	5,966	nw.	36	se.	2	2	9	20	19.7	1.7	2	10	94	*	68	1886								
Jupiter.....	28	30.07	30.10	0.22	81.5	-0.5	95	87.7	72	75.2	21	7	75.0	82.0	4.00	-0.54	5,864	se.	28	se.	31	15	10	6	9.4	7.4	1	2	95	*	69	1888								
Key West.....	22	30.06	30.08	0.16	83.2	-2.8	89	87.6	71	78.8	16	5	74.4	73.7	1.51	-2.80	5,644	e.	20	e.	29	5	17	9	12.6	3.4	6	100	1886	68	1888									
Micco.....	44	30.05	30.09	0.25	81.0	-0.2	93	87.4	70																															



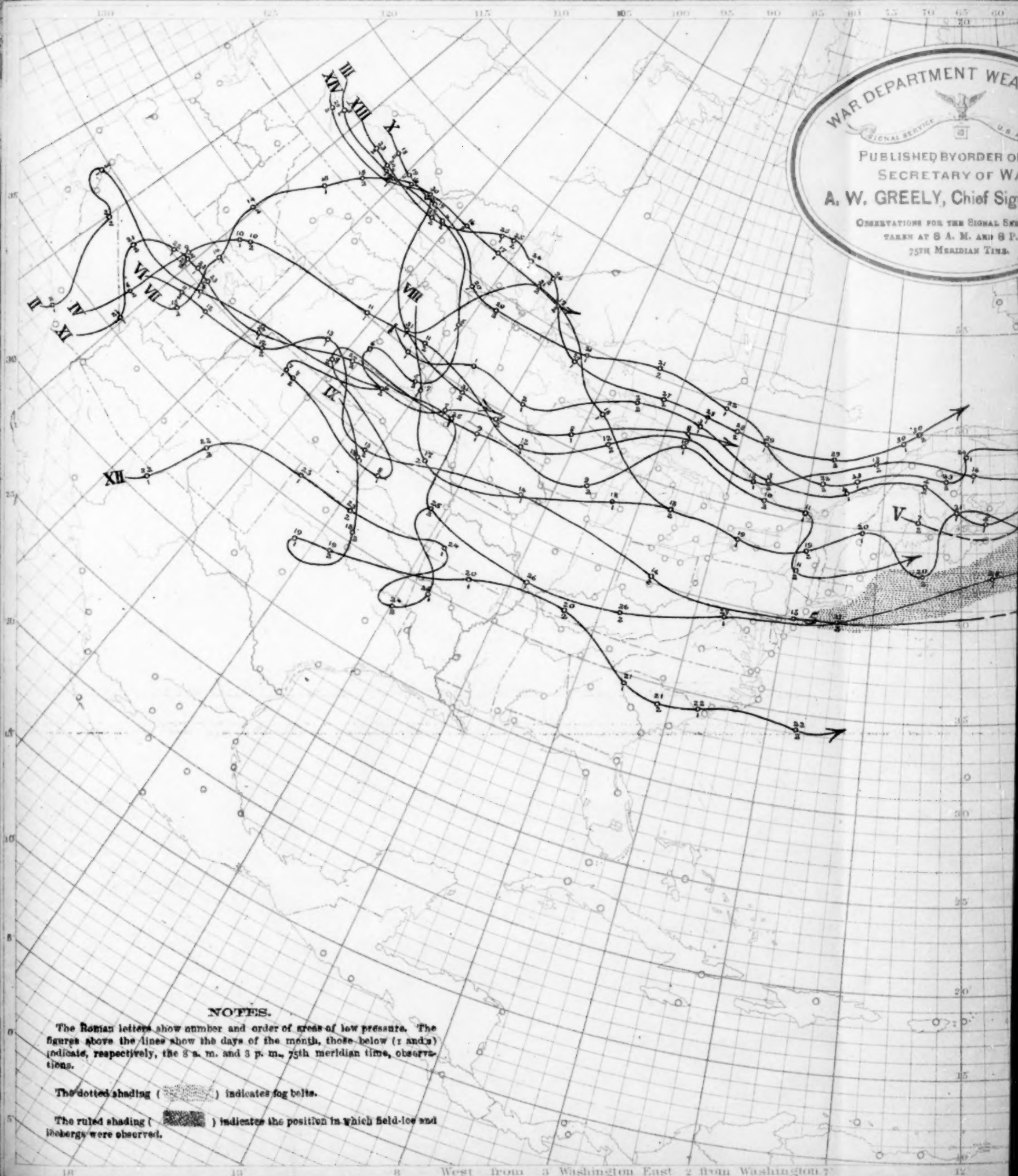
*Table of miscellaneous meteorological data for July, 1889—Signal Service observations—Continued.*

[illegible]

NOTE.—The data at stations having no departures are not used in computing the district averages. Letters of the alphabet denote number of days missing from the record.  
\* Two or more directions, dates, or years. † Precipitation measured at the Boston Water Works; takes the place of the measurement at the Signal Office. ‡ Received too late to be considered in averages.



# Chart I. Tracks of Areas of Low Pressure



WAR DEPARTMENT WEATHER  
SIGNAL SERVICE  
PUBLISHED BY ORDER OF  
SECRETARY OF WAR  
A. W. GREELY, Chief Signal Officer  
OBSERVATIONS FOR THE SIGNAL SERVICE  
TAKEN AT 8 A. M. AND 8 P. M.  
75TH MERIDIAN TIME.

## NOTES.

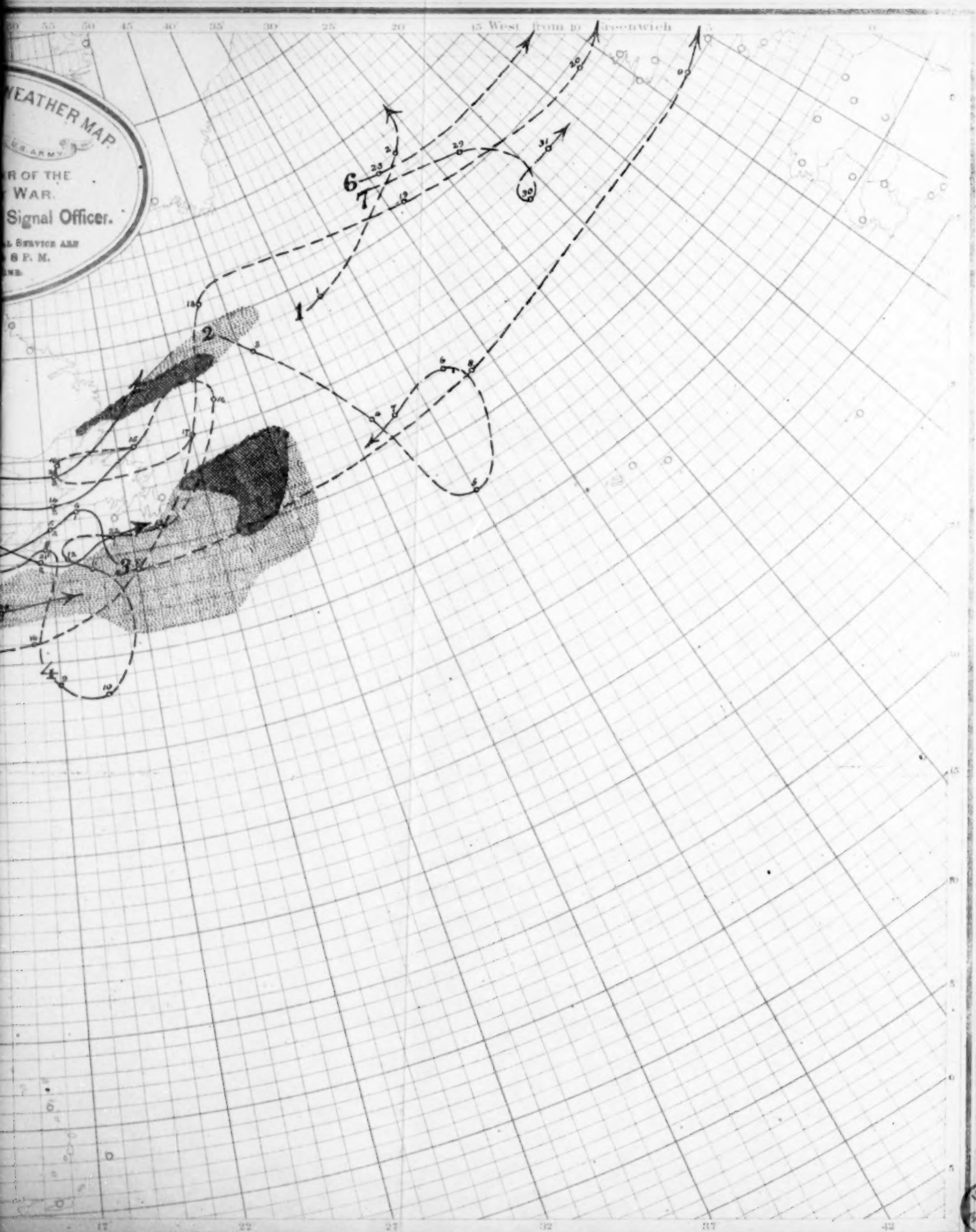
The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1 and 2) indicate, respectively, the 8 a. m. and 8 p. m., 75th meridian time, observations.

The dotted shading ( ) indicates fog belts.

The ruled shading ( ) indicates the position in which field-ice and icebergs were observed.



Pressure. July, 1889.

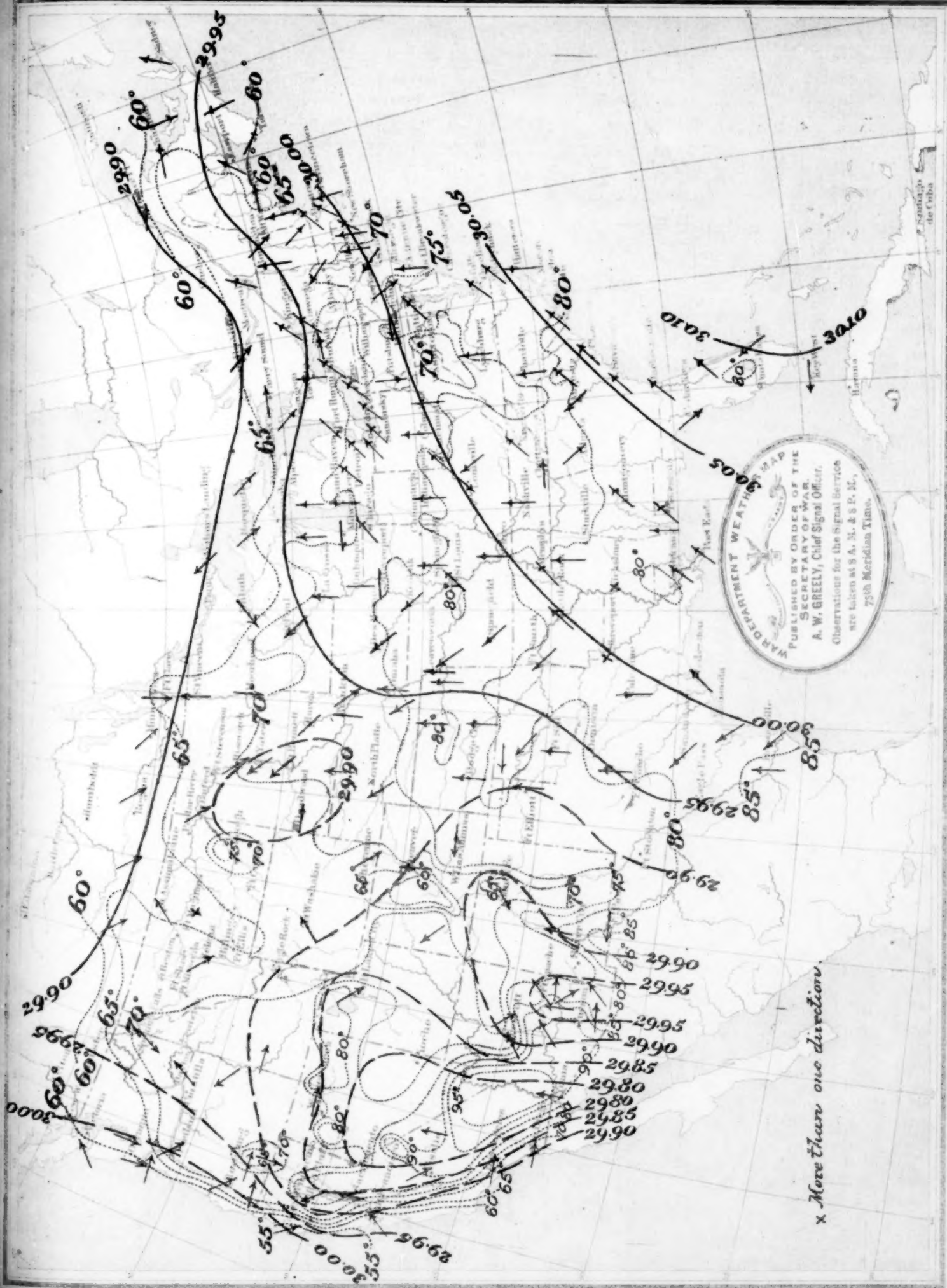


Signal Office Lib

Chart II. Isobars, Isotherms, and Winds. July, 1889.



Chart II. Isobars, Isotherms, and Winds. July, 1880.



x More than one direction.

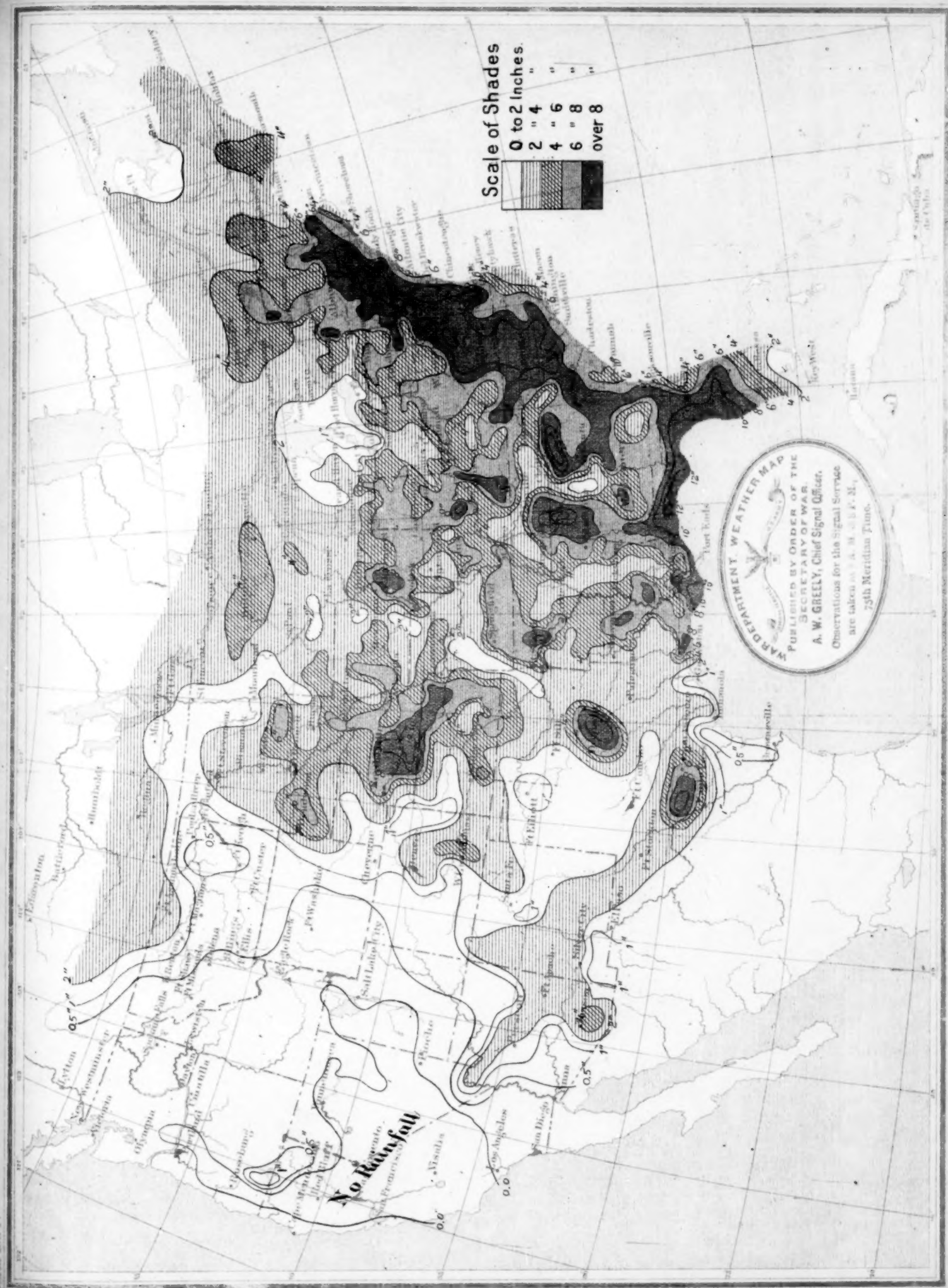






Chart III Precipitation, July, 1889.

Figure 1061 P.



Signal Office Wash.



Place	Player
Aut	Aut
Clit	Clit
Col	Col
Liv	Liv
Mad	Mad
Wal	Wal
Ant	Ant
Asu	Asu
Ced	Ced
Coo	Coo
Fai	Fai
Fla	Fla
Glo	Glo
Loo	Loo
Ne	Ne
Tex	Tex
Top	Top
Tig	Tig
Str	Str
Wal	Wal
Wil	Wil
Win	Win
Loo	Loo
Low	Low
9	9
Amo	Amo
And	And
Ber	Ber
Cele	Cele
Cre	Cre
Goo	Goo
Hyl	Hyl
Jot	Jot
Low	Low
Low	Low
Mou	Mou
Ne	Ne
Nat	Nat
Oak	Oak
Pal	Pal
Sal	Sal
San	San
San	San
Stu	Stu
Vac	Vac
Wal	Wal
Wal	Wal
Whi	Whi
Win	Win
Ben	Ben
Col	Col
Con	Con
Del	Del
Fr	Fr
Gr	Gr
Gr	Gr
Gr	Gr
Gr	Gr
Har	Har
New	New
Alje	Alje
Arn	Arn
Car	Car
Car	Car
Clas	Clas
Ev	Ev
Gal	Gal



*List of voluntary stations of the Signal Service, with their respective observers, who furnish meteorological reports for the Monthly Weather Review. Reports have not been received from those marked with an asterisk (\*) in time to be used in the Review for July, 1889.*

Place of observation and observer.	Place of observation and observer.	Place of observation and observer.	Place of observation and observer.	Place of observation and observer.
<p><b>ALABAMA.</b>                      Auburn, Ala. Weather Service.                      Bermuda, Wm. Fowler.                      Citronelle, J. G. Michael.                      Columbiana, W. D. Lovett.                      Livingston, Prof. J. W. A. Wright.                      Lurline, J. O. Sentell.                      Motes, A. M. Weiler.                      Mount Willing, W. M. Garrett.                      Valley Head, E. P. Nicholson, M. D.                      Wiggins, M. D. Jones.  <b>ARIZONA.</b>                      Antelope Valley, Mrs. J. H. Hamill.                      Ash Canyon, Jno. S. Robbins.                      Bangharts, Geo. Banghart.                      Cedar Springs, R. E. Norton.                      Cooley's, C. E. Cooley.                      Curtis, Dr. R. B. Tripp.                      Fairbank, S. W. Wood.                      Flagstaff, M. J. Riordan.                      Florence, A. T. Colton, C. E.                      Gila Bend, David Murphy.                      Globe, J. H. Hamill.                      Holbrook, David Rope.                      Litchfield, Rochester Ford.                      Mount Huachuca, J. W. Stump.                      New River, J. F. Singleton.                      Tevison, Miss Mary Tevis.                      Tip Top, F. E. Wager.                      Tombstone, S. C. Bogg.                      Tucson, Edward L. Wetmore.                      Signal, Wm. Koshland.                      Strawberry, L. P. Nash.                      Volunteer Spgs, W. J. Hill.                      Walnut Grove, T. B. Carter.                      Williams, J. T. Ryan.                      Willow Springs, F. A. Chamberlin.                      Winslow, C. J. Dillon.  <b>ARKANSAS.</b>                      Lead Hill, Silas C. Turnbo.                      Little Rock, Arkansas Weather Service.                      Winslow, Albert Dunlap.  <b>CALIFORNIA.</b>                      American Hill, C. F. Macy.                      Anderson, Dr. A. Fouch.                      Barstow, Geo. R. Gooding.                      Berkeley, Prof. F. Soule.                      Centerville, Wm. Barry.                      Colgrove, Seward Cole.                      Crescent City, D. S. Shotwell.                      Evergreen, S. Holland.                      Georgetown, C. M. Fitzgerald.                      Grass Valley, B. F. Berriman.                      Hydeville, E. T. Foss.                      Iowa Hill, L. T. Dwight.                      Jolon, T. T. Tidball.                      Julian, L. N. Bailey.                      La Grange, Jos. Dominica.                      Lewis Creek, John Tuohy.                      Los Banos, A. Widmann.                      Mount Hamilton, Lick Observatory.                      National City, J. E. Boal.                      Needles, John J. Clark.                      Oakland, Dr. J. B. Trembley.                      Oroville, Hiram Arents.                      Palmdale, Welwood Murray.                      Sacramento, S. H. Gerrish.                      Salinas, Dr. E. K. Abbott.                      San Bernardino, A. K. Holt.                      San Luis Obispo, J. E. Lewis.                      Santa Barbara, H. D. Vail.                      Santa Clara, A. Block.                      Santa Maria, L. E. Blochman.                      Susanville, T. B. Sanders.                      Vacaville, G. O. Colburn.                      Walla Walla Creek, J. Titcomb.                      Walnut Creek, A. L. Bancroft.                      Wheatland, Wm. Lumbard.                      Willow, David Bentley.  <b>COLORADO.</b>                      Bennet, I. S. Putnam.                      Colorado Springs, Colo. Weather Service.                      Conter, Capt. Jesse E. Glick.                      Delta, J. A. Curtis.                      Denver, Rev. Wm. Forstall.                      Fraser, L. D. C. Gaskill.                      Fort Collins, Prof. L. G. Carpenter.                      Grand Lake, Jas. Cairns.                      Georgetown, W. A. Jayne, M. D.                      Greeley, E. Bethel.                      Palmer Lake, Thos. Gaddis, M. D.                      Rocky Ford, F. Watrous.  <b>CONNECTICUT.</b>                      Hartford, W. W. Ellsworth.                      New Hartford, Rev. Wm. Goodwin.                      Volantown, Rev. E. Dewhurst.  <b>DAKOTA.</b>                      Alexandria, L. C. Taylor.                      Armour, Jno. J. Angus.                      Brookings, Prof. Lewis McLouth.                      Canton, W. M. Cappett.                      Carrington, H. M. Durbrow.                      Clark, W. H. Boals.                      Davenport, J. W. Leech.                      De Smet, Thos. H. Ruth.                      Garden, S. J. Pound.                      Garden City, W. C. T. Newall.</p>	<p><b>DAKOTA—Continued.</b>                      Huron, Dakota, Weather Service.                      Kimball, A. S. Stuver.                      Napoleon, J. H. Hoof.                      New England City, E. S. Clough.                      Onida, Mrs. M. F. Goddard.                      Parkston, John J. Swartz.                      Redfield, W. H. Dempster.                      Roscoe, C. H. Spencer.                      Spearfish, J. H. Warren.                      Spring Lake, A. Gould.                      Steele, F. R. Hill.                      Wahpeton, C. I. Croft.                      Webster, Arthur Betts.                      Wolsey, G. W. Frink.                      Woonsocket, L. O. Libbey.  <b>DELAWARE.</b>                      Kirkwood, Wm. Carnagy.  <b>DISTRICT OF COLUMBIA.</b>                      *Kendall Green, Deaf and Dumb Institute.  <b>FLORIDA.</b>                      Altamonte Spgs, M. E. Bingham.                      Alva, Chas. E. Robins.                      Archer, A. F. Wyman.                      Fort Meade, A. H. Adams.                      Homeland, J. S. Wade.                      Kissimmee, E. E. W. Brewster.                      *Lake City, Dr. J. C. Neal.                      Manatee, Mrs. Mary W. Broberg.                      Matanzas, Mrs. B. E. Dupont.                      Merritt's Island, Rev. J. H. White.                      Tallahassee, Rev. Dr. W. H. Carter.                      Villa City, J. Emory Round.  <b>GEORGIA.</b>                      Andersonville, H. W. Bryant.                      Athens, Prof. L. H. Charbonnier.                      Diamond, Wm. Kimzey.                      Duck, A. L. Gillespie.                      Forsyth, Thos. G. Scott.                      Gillsville, C. W. Meaders.                      Hephzibah, R. L. Rhodes.                      Marietta, G. S. Owen.                      Milledgeville, S. A. Cook.                      Point Peter, G. M. Witcher.                      *Quitman, J. L. Cutler.                      Thomasville, C. S. Boudurant.                      Woolley's Ford, A. J. Julian.  <b>IDAHO.</b>                      Era, Hervey Brooks.                      Kootenai, David McLaughlin.                      Lewiston, Robert Schleicher.                      Soda Springs, L. C. Eastman.  <b>ILLINOIS.</b>                      Charleston, J. B. Dawey.                      Collinsville, Dr. J. L. R. Wadsworth.                      Mattoon, Wm. Dozier.                      Mount Morris, Wm. Feary.                      Oswego, John S. Seely.                      Palestine, John E. Templeton.                      Pekin, Rev. J. E. Terborg.                      Peoria, Dr. Fred. Brendle.                      Philo, H. A. Burr.                      Riley, John W. James.                      Rockford, T. D. Robertson.                      Sandwich, Dr. N. E. Ballou.                      South Evanston, Dr. M. D. Ewell.                      Springfield, Ill. Weather Service.                      Sycamore, Roswell Dow.                      Windsor, A. H. Hatch.  <b>INDIANA.</b>                      Butlerville, C. F. Hole.                      Dana, J. E. Wright.                      Hometown, J. C. Hunter.                      Jeffersonville, J. C. Loomis.                      *Laconia, L. F. Crozier.                      La Fayette, Ind. Weather Service.                      La Fayette, Purdue Institute.                      Maury, Elwood Kirkwood.                      New Providence, Prof. E. S. Hallett.                      Point Isabel, Jas. F. Hood.                      Scalesville, Urias Wilson.                      Sunman, Dr. E. B. Vincent.                      Vevay, Prof. Chas. Boerner.  <b>INDIAN TERRITORY.</b>                      Caddo Creek, B. Leming, M. D.                      Guthrie, Morris Collar.                      Jimtown, M. M. Yeakly.                      Lehigh, F. M. Madden.                      Oklahoma, C. F. Sommer.  <b>IOWA.</b>                      Amana, Conrad Schadt.                      Ames, J. Rush Lincoln.                      Bancroft, H. N. Renfrew.                      Blakeville, James Rogers.                      Cedar Rapids, H. D. Olds.                      Clarinda, A. S. VanSandt.                      Clinton, Luke Roberts.                      Cresco, Gregory Marshall.                      Cromwell, Harry C. Harrison.                      Des Moines, H. B. Brackett.                      Des Moines, Adolphus Voegeli.                      Des Moines, Iowa, Weather Crop Bulletin Service.                      *Dunkerton, J. W. Boyle.                      Dysart, Jos. Dysart.                      Eagle Grove, C. A. Schaffer.                      Elkader, J. N. Hamilton.                      Fayette, R. Z. Latimer.</p>	<p><b>IOWA—Continued.</b>                      Fort Madison, Miss. L. A. McCreedy.                      Gillett, H. L. Pierce.                      Glenwood, Seth Dean.                      Glenwood, A. Schappel.                      Grinnell, Prof. S. J. Buck.                      Hampton, E. C. Grenelle.                      *Humboldt, Miss Florence Prouty.                      Independence, Emil F. Wulfke.                      Iowa City, Prof. A. A. Vebelen.                      Jefferson, S. M. Taylor.                      Logan, Mrs. M. B. Stern.                      McGregor, A. F. Hofer.                      Manson, W. L. Thompson.                      Maquoketa, A. B. Bowers, M. D.                      Monticello, H. D. Smith.                      Mount Pleasant, Dr. Max E. Witte.                      Mt. Vernon, Prof. Alonzo Collin.                      Muscatine, J. P. Walton.                      Osage, G. D. Pattingill.                      Oskaloosa, Joseph Boyd.                      Oskaloosa, O. H. Avey.                      Sac City, Dr. Caleb Brown.                      Vinton, T. F. McCune.                      Washington, Wm. A. Cook.                      Webster City, C. M. Trumbauer.                      Wesley, Wm. Ward.  <b>KANSAS.</b>                      Allison, John J. Cass.                      Bendena, G. Campbell.                      Cawker City, A. G. Alrich.                      Colby, C. E. Bennett.                      Cunningham, E. Shaw.                      Elk Falls, Dr. A. C. Williams.                      Emporia, Prof. T. H. Dinsmore, jr.                      Englewood, C. D. Perry.                      Fremont, E. Atkin.                      Gibson, C. M. Bell.                      Globe, Wm. Featherston.                      Havensville, J. W. Dennen.                      Independence, L. M. Altaffer.                      La Harpe, Isaac S. Coe.                      Lawrence, Prof. F. H. Snow.                      Lebo, C. B. Jennings.                      Leoti, R. A. Ramey.                      Macksville, C. E. Poling.                      Manhattan, C. P. Blachley.                      *Manhattan, F. J. Rogers.                      Morse, R. P. Edgington.                      Rago, D. S. Stratton.                      Rome, D. M. Adams.                      Salina, J. H. Gibson.                      *Santa Fe, Judge A. P. Heminger.                      Sedan, J. W. Goodell.                      Topeka, Kansas Weather Service.                      Tribune, S. B. Jackson.                      Wakefield, Wm. P. Cochran.                      Wellington, John H. Wolfe.                      Yates Center, F. E. Gray.  <b>KENTUCKY.</b>                      Ashland, J. M. Ferguson.                      Bernstadt, John de Planta.                      Bowling Green, M. H. Crump.                      Canton, C. H. Major.                      Earlinton, J. B. Atkinson.                      Falmouth, F. G. Held.                      Frankfort, E. C. Went.                      Franklin, T. W. MacGill.                      Louisville, Ky. Weather Service.                      McHenry, M. G. Duncan.                      Madisonville, T. J. Gill.                      *Millersburg, Rev. C. Pope.                      Mount Sterling, H. C. McKee.                      Owensboro, Watkins &amp; Carter.                      *Owenton, J. S. Cox.                      Pellville, Oscar Haynes.                      Richmond, Prof. O. A. Kennedy.                      Shelbyville, H. W. Prissler.                      South Fork, A. B. Gilbert.                      Springfield, W. U. Rog.  <b>LOUISIANA.</b>                      Cameron, Hon. S. P. Henry.                      Emilie, Dr. L. D. Chauff.                      *Grand Coteau, Rev. C. M. Widman.                      Houma, H. F. Belanger.                      Liberty Hill, E. A. Crawford.                      Luling, F. M. Rogers.                      Marksville, Leon Molinar.                      New Iberia, Mrs. J. A. Gebert.                      New Orleans, La., Weather Service.                      Point à la Hache, F. C. Myers.                      Winnfield, J. M. McCain.  <b>MAINE.</b>                      *Bar Harbor, Joseph Wood.                      Cornish, Silas West.                      Gardiner, Henry Richards.                      *Kent's Hill, W. C. Strong.                      Orono, Prof. M. C. Fernald.  <b>MARYLAND.</b>                      Barren Creek Springs, Albert E. Acworth.                      Cumberland, E. T. Shriver.                      Fallston, Prof. G. G. Curtis.                      Frederick, McIntock Young.                      Gaithersburg, J. T. De Sellum.                      Galena, Henry Parr.                      Gambrills, J. E. Moque.                      Jewell, Jos. Plummer.</p>	<p><b>MARYLAND—Continued.</b>                      McDonogh, McDonogh Institute.                      *Mt. St. Mary's, Mt. St. Mary's College.                      Woodstock, Woodstock College.  <b>MASSACHUSETTS.</b>                      Amherst, Miss S. C. Snell.                      Amherst, Mass. Agricultural Experimental Station.                      Blue Hill, Rev. A. K. Teele.                      Blue Hill Observatory, A. L. Rotch.                      Cambridge, Harvard College Observatory.                      Chestnut Hill, D. Fitzgerald.                      Dudley, Conant Observatory.                      Fall River, C. V. S. Remington.                      Heath, B. B. Cutler.                      Holyoke, J. W. Doran.                      Leicester, Arthur Kendrick.                      Nahant, Dr. Wm. D. Hodges.                      New Bedford, Thos. R. Rodman.                      Newburyport, F. V. Pike.                      North Billerica, C. H. Kohlrausch.                      Provincetown, John R. Smith.                      Royalston, Miss Lizzie W. Chase.                      Somerset, Elisha Slade.                      Taunton, E. U. Jones, M. D.                      Westborough, G. S. Newcomb.                      *Williamstown, Williams College Observatory.                      Worcester, J. B. Hall.  <b>MICHIGAN.</b>                      Berrien Springs, F. A. Zerby.                      Birmingham, S. Alexander.                      *Harrisville, Dr. D. W. Mitchell.                      Hudson, Major A. H. Boies.                      Kalamazoo, W. A. Black.                      Lansing, Dr. H. B. Baker.                      Lansing, Mich. Weather Service.                      Marshall, G. H. Greener, M. D.                      Motville, J. A. Hartzler.                      Thornville, John S. Caulkins.                      Traverse City, S. E. Wait.                      Ypsilanti, J. C. Bemiss.                      Ypsilanti, C. S. Woodard.  <b>MINNESOTA.</b>                      Le Sueur, L. B. Davis.                      Minneapolis, Wm. Cheney.                      Northfield, G. H. Alden.                      Saint Paul, Minnesota Weather Service.  <b>MISSISSIPPI.</b>                      Bonneville, A. G. Smith.                      Fayette (near), I. N. Bedford.                      Kosciusko, L. Heyman.                      Logtown, C. D. Koch.                      Louisville, B. T. Webster.                      Macon, A. T. Dent.                      Pontotoc, C. W. Bolton, M. D.                      Summit, J. N. Teunisson.                      University, Mississippi Weather Service.                      Waynesborough, W. S. Daries.  <b>MISSOURI.</b>                      Columbia, Mo. Weather Service.                      Conception, Rev. Fr. Paul.                      Excelsior Springs, A. Reinisch.                      Fayette, Prof. T. Berry Smith.                      Frankford, W. W. Vermillion.                      Glasgow, Prof. C. W. Pritchett.                      Grand Pass, E. E. Graham.                      Harrisonville, A. J. Sharpe.                      Hermann, Chas. Maushund.                      Kansas City, S. J. Spurgeon.                      La Monte, J. S. Slaven.                      New Frankford, G. W. Hawkins.                      New Haven, Max Embueck.                      Oak Ridge, Henry Brühl.                      Ozark, J. J. Brown.                      Princeton, Dr. Wm. Hiron.                      St. Charles, Dr. J. R. Mudd.                      Savannah, R. Van Buskirk.                      Sedalia, C. G. Taylor.                      Shelbyville, J. S. Chandler.                      Steelville, E. A. Pinnell.                      Willow Springs, Capt. Wm. Hugh.                      Withers Mill, J. R. Dudley.  <b>MONTANA.</b>                      Glendive, W. C. Wood.                      Fort Logan, Wm. Gaddis.                      Powder River, J. M. Graham.                      Sheldon, Sarah E. Sheldon.                      Virginia City, Eugene Stark.  <b>NEBRASKA.</b>                      Ansley, P. Fowle.                      Bingham, W. C. Wood.                      Brownsville, G. D. Carrington.                      Creighton, George Roberts.                      Crete, Nebraska Weather Service.                      Crete, G. F. Gilbert.                      Culbertson, Mrs. Lizzie A. Wible.                      David City, E. B. Taylor.                      De Soto, Chas. Selts.                      Fairbury, Dr. I. Humphrey.                      Falls City, A. B. Newkirk.                      Fremont, Isaac E. Heaton.                      Genoa, George S. Truman.                      Gering, Jno. P. Finley.                      Holmesville, H. E. Sillik.                      Hay Springs, Wm. Waterman.                      Kennedy, Mrs. M. G. Ericson.</p>	<p><b>NEBRASKA—Continued.</b>                      Kimball, D. Henderson, Jr.                      Marquette, John Ellis.                      Mullen, F. L. Mary.                      North Loup, E. W. Black.                      Stratton, J. B. Slime.                      Syracuse, P. W. Rissler.                      Tecumseh, W. L. Dunlap.                      Weeping Water, G. Treat.  <b>NEVADA.</b>                      Carson City, Chas. W. Friend.                      Carson City, Nevada Weather Service.  <b>NEW HAMPSHIRE.</b>                      Antrim, Frank W. Palmer.                      Berlin Mills, Q. A. Bridges.                      Concord, W. L. Foster.                      Nashua, Chas. H. Webster.                      North Sutton, C. E. Hoamer.                      Shaker Village, N. A. Briggs.                      Belmont, Lake Winipisec.                      Bristol, Lake Village.                      Weir's Bridge, Woolen Manufacturing Co.                      Wolfeborough.  <b>NEW JERSEY.</b>                      Taunton, E. U. Jones, M. D.                      Egg Harbor City, H. Y. Postma.                      *Jersey City, Wright Babcock.                      Moorestown, Thos. J. Beans.                      New Brunswick, N. J. Weather Service.                      Readington, John Fleming.                      South Orange, Dr. W. J. Chandler.                      Woodbury, W. T. Wilson.  <b>NEW MEXICO.</b>                      Albuquerque, S. M. Rowe.                      Coolidge, B. S. Mullin.                      Gallinas Spring, J. E. Whitmore.                      Hillsborough, J. E. Smith.                      Las Vegas, F. W. Chatfield.                      Los Lunas, Richard Pohl.                      Nogal, Red Canyon (Carthage), R. H. Hills.  <b>NEW YORK.</b>                      Alfred Centre, F. S. Place.                      Angelica, J. P. Slocum.                      Arcade, Homer W. Clough.                      Ardenia, Richard B. Arden.                      Auburn, Geo. Casey.                      Boyd's Corners, Thos. Manning.                      Canton, Prof. Henry Priest.                      Constableville, R. Sanford Miller.                      Cooperstown, G. Pomeroy Keese.                      Eden, W. P. Hunt.                      Elmira, Gerity Brothers.                      Factoryville, T. P. Yates.                      Fleming, Robt. Warwick.                      *Friendship, Jesse D. Rogers.                      Geneva, Mrs. N. S. Yates.                      Hess Road Station, C. H. Spaulding.                      Honeyead Brook (Stanfordville), James Hyatt.                      Humphrey, Chas. E. Whitney.                      Iilon, G. A. Trowbridge.                      Ithaca, Cornell University.                      Ithaca, N. Y. Weather Service.                      Kingston, H. A. Stone.                      *Le Roy, Prof. F. M. Comstock.                      Lowville, W. Hudson Stephens.                      Lyons, Dr. M. A. Veeder.                      Middleburgh, F. X. Straub.                      Newfane Station, F. B. Clark.                      New York City, Central Park Observatory.                      Ninerech, W. J. Barnett.                      North Hammond, C. A. Wooster.                      Number Four, Chas. Fenton.                      Palermo, E. B. Bartlett.                      Palmyra, L. D. Cummings.                      Pendleton, W. D. Lovell.                      Perry City (near), W. H. Jeffers.                      Potsdam, Peter Vilas; G. W. F. Smith.                      Queensbury, De Witt C. Jenkins.                      Rome, Dr. H. C. Sutton.                      *Saranac Lake, Jas. P. Mills.                      Savona, M. S. Collier, M. D.                      Setauket, Selah B. Strong.                      Somerset, J. W. Thurber.                      South Canisteo, J. E. Willson.                      South Kortright, D. C. Sharpe.                      Tannersville, H. M. Wilson, Jr., M. D.                      *Twin, R. T. Chereh.                      Utica, Thos. Birt.                      Wedgewood, O. F. Corwin.                      White Plains, Prof. O. R. Willis.  <b>NORTH CAROLINA.</b>                      Asheville, Dr. Karl von Ruck.                      Grover, F. H. Dover.                      Lenoir, Dr. R. L. Beall.                      Mount Pleasant, H. L. T. Ludwig.                      *Raleigh, Thos. C. Harris.                      Raleigh, North Carolina Weather Service.                      Soapstone Mountain, H. L. Kimrey.                      Weldon, T. A. Clark.</p>



*List of voluntary stations of the Signal Service, with their respective observers, who furnish meteorological reports for Monthly Weather Review—Cont'd.*

Place of observation and observer.	Place of observation and observer.	Place of observation and observer.	Place of observation and observer.	Place of observation and observer.
<b>OHIO.</b> Beallsville, R. D. McGanghy. Bellevue, Wm. Sheffield. Carrollton, P. M. Herold. Cleveland, G. A. Hyde. College Hill, John W. Hammitt. Collinwood, Wm. Smeed. Columbus, Ohio Weather Service. Demos, B. B. Ault. Elyria, C. W. Goodspeed. Garrettsville, S. M. Luther. *Glasgow, W. McHane. Jacksonborough, Dr. J. B. Owsley. Kent, P. W. Eigner. Kenton, L. J. Demarest. Leipsic, J. D. Hadermann. Lordstown, W. S. Dean. Napoleon, Dr. T. C. Hunter. New Athens, Jos. Holmes. North Lewisburgh, H. D. Gowey. Orangeville, E. N. Hyde. Portsmouth, Dr. D. B. Cotton. Painesville, Chas. Stewart. Shaloh, Peter Bowman. Tiffin, Rev. T. H. Sonedeker. Vienna, W. D. McCorkle. Wauseon, Thos. Mikesell. Westerville, Prof. John Haywood. West Milton, Luke S. Mottie. Yellow Spgs, Miss Eliza G. Rice. <b>OKLAHOMA.</b> Albany, John Briggs. Bandon, Geo. Bennett. East Portland, Dr. Geo. Wigg. Eola, Thos. Pearce. Grant's Pass, Jno. G. Jessup. Heppner, Arthur Smith. La Grande, J. K. Romig. Mt. Angel, Rev. F. Barnabas Held. Portland, Oreg. Weather Service. Tillamook, A. P. Wilson. <b>PENNSYLVANIA.</b> Altoona, Chas. B. Dudley, M. D. Aqueduct, D. M. Sheely. Blooming Grove, John Grathwohl. Blue Knob, A. H. Boyle. Catawissa, Robt. M. Graham. <b>PENNSYLVANIA—Continued.</b> Corry, Wm. Loveland. Drifton, H. D. Miller. Dyberry, Theo. Day. Easton, Dr. J. W. Moore. Edinborough, C. F. Sweet. Franklin, Joseph Bell. Germantown, Thos. Meehan. Grampian Hills, Nathan Moore. Haverford, H. V. Gummere. Le Roy, Geo. W. T. Warburton. Meadville, David Logan. Meshoppen, Stephen S. Jenkins. Nisbet, J. S. Gibson. Petersburg, J. E. Rooney. Philadelphia, Pennsylvania Weather Service. Philipsburgh, G. F. Dunkle. Pleasant Mount, J. D. Brennan. Quakertown, J. L. Heacock. Reading, C. M. Dechant. Salem Corners, T. B. Orchard, M. D. State College, Agricultural Ex- perimental Station. Tipton, Miss C. J. Wilson. Troy, Rev. M. Gustin. Tuscarora, R. J. Micky. Wellsborough, Hiram D. Deming. West Chester, Dr. Jesse C. Green. <b>RHODE ISLAND.</b> Kingston, C. O. Flagg. <b>SOUTH CAROLINA.</b> *Aiken, Dr. W. H. Geddings. Cedar Springs, J. T. Bayerly. Columbia, S. C. Weather Service. Kirkwood, Colin Macrae. Port Royal, H. D. Elliott. Statesburgh, Dr. W. W. Anderson. Simpsonville, Miss N. L. Dawson. <b>TENNESSEE.</b> Ashwood, Rev. C. F. Williams. Austin, P. B. Calhoun. Cumberland Gap, A. A. Arthur. Milan, Dr. M. D. L. Jordan. Nashville, State Board of Health. Riddleton, F. K. Fergusonson. <b>TEXAS.</b> Austin, Oscar Samosts. <b>TEXAS—Continued.</b> Austin, G. C. Smith, M. D. *Baird, D. Richardson. Bear Creek Rancho, W. H. Potter. Belton, E. A. Sterling. Brazoria, H. Stevens. *Brenham, J. G. Sloan. Brownwood, J. F. Mayo. Cedar Hill, J. P. Berry. Cleburne, P. J. Norwood. Coldwater, J. W. O'Brien. *Colorado, Fred R. Blount. Columbia, J. S. Rogers. Corsicana, E. L. Gibson. Corsicana, W. H. Hamilton. Decatur, H. D. Donald. Duval, J. C. Edgar. Forestburg, J. N. Morris. Fort Worth, Jas. G. Maillett. Fredericksburgh, Arthur Strieg- ler. Gainesville, D. F. Ragsdale. Gallinas, Lum Woodruff. Galveston, Tex. Weather Service. Graham, A. B. Grant. Granger, E. H. Snider. Hartley, E. L. McDonough. Howe, W. M. Smith. La Grange, Jos. Cottam. Lampasas, Dr. C. M. Ramsdell. Merkel, J. L. Vaughan. Mesquite, Silas G. Lackey. Menardville, Louis Runge. Navasota, C. E. Hull. New Braunfels, Paul Wipprecht. New Ulm, C. Runge. Pecos City, C. H. Merriman. Roby, Crane & Keifer. Silver Falls, C. M. Tilford. Snyder, A. C. Wilmeth. <b>UTAH.</b> Beaver, Rev. J. D. Gillilan. Levan, A. B. Larsen. Loses, Ephraim Caffall. *Mount Carmel, Robert Moncur. Mount Pleasant, Hans C. Davidson. Nephi, W. R. May. Saint George, Seth A. Pymm. <b>VERMONT.</b> Brattleborough, W. H. Childs. Burlington, W. B. Gates. *Coventry, W. H. Tibbets. East Berkshire, H. B. Lovering. Lunenburg, Dr. Hiram A. Cutting. Manchester, Rev. E. P. Wild. Newport, M. B. Trasher. Saint Johnsbury, F. Fairbanks. Stratford, H. F. J. Scribner. <b>VIRGINIA.</b> Bolar, G. F. Eakle. Bird's Nest, C. R. Moore. Christiansburgh, H. D. Walters. Dale Enterprise, L. J. Heatwole. Lexington, Prof. H. D. Campbell. Mossingford, R. V. Gaines. Petersburg, Jas. M. Colson, Jr. Smithfield, J. R. Purdie. Spottsville, B. W. Jones. Summit, J. R. Sim. University of Virginia, James Wearmouth. Wytheville, Howard Shriver. <b>WASHINGTON TERRITORY.</b> Blakely, R. M. Hoskinson. Vashon, Mrs. C. B. Carpenter. <b>WEST VIRGINIA.</b> *Clarksburgh, R. T. Lowndes. Ella, Henry Resseger. Egion, Julius Scherr. Kingwood, J. E. Murdock. Pleasant Hill, D. Tichenell. Rockport, R. D. J. Echols. Seven Pines, J. R. Sharer. Rivesville, J. T. Parsons and F. F. Priekett. Rowlesburgh, M. J. Coniff. Tannery, G. H. Tremblay. Tyler Creek, F. M. Swann. <b>WISCONSIN.</b> Cadiz, B. C. Curtis. Delavan, George L. Collie. Embarras, J. E. Breed. Fond du Lac, J. C. Wedge. Friendship, J. M. Harrison. *Glasgow, Henry M. Crombie. <b>WISCONSIN—Continued.</b> Grantsburgh, M. L. Roby, M. D. Greenwood, H. J. Thomas. Hayward, J. M. Custard. Lincoln, A. J. Loose. Madison, Washburn Observatory. Manitowoc, Miss Clasina Laps. Neillville, W. Heaslett. *Oshkosh, Prof. W. N. Mumper. Richland Centre, H. M. Ludwig. Summit Lake, E. S. Koepenick. Viroqua, F. J. Bold. Wausau, G. H. Yapp. Wausau, Hinemann Bros. Weston, R. R. Wilkinson. <b>WYOMING.</b> Lusk, F. S. Lusk. Wheatland, M. R. Johnston. <b>FOREIGN.</b> Burnside, S. A., Dr. C. J. Hering. Grand Turk, West Indies, Geo. L. Gibbs. Guanajuato, Mexico, Meteoro- logical Observatory. Hamilton, Bermuda, Gen. Russell Hastings. Havana, Cuba, Dr. Enrique del Monte. Killisnoo, Alaska, Jos. Zuboff. La Logia, Mexico, H. Patrick. Leon, Mexico, Prof. M. Leal. Mazatlan, Mexico, Leon P. Acosta. Mexico, Mexico, Meteorological Observatory. Monterey, Mexico, Dr. Wm. D. Rye. Montreal, Quebec, C. H. McLeod. New Westminster, B. C., Capt. A. Peele. Port au Prince, Hayti, Prof. I. Scherer. Pueblo, Mexico, Catholic Insti- tute. Topolobampo, Mexico, Capt. John Bell. Zacatecas, Mexico, Jose A. y Bo- rilla.				

*Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for July, 1889.*

<b>ALABAMA.</b> Mount Vernon Barracks. <b>ARIZONA.</b> Apache, Fort. Bowie, Fort. Huachuca, Fort. Lowell, Fort. McDowell, Fort. Mojave, Fort. San Carlos. Verde, Fort. Whipple Barracks. <b>ARKANSAS.</b> Hot Springs. Little Rock Barracks. <b>CALIFORNIA.</b> Alcatraz Island. Angel Island. Benicia Barracks. Bidwell, Fort. Gaston, Fort. Mason, Fort. *Presidio, San Francisco. San Diego Barracks.	<b>COLORADO.</b> Crawford, Fort. Lewis, Fort. Logan, Fort. Lyons, Fort. <b>CONNECTICUT.</b> Trumbull, Fort. <b>DAKOTA.</b> A. Lincoln, Fort. Bennett, Fort. Buford, Fort. Meade, Fort. Pembina, Fort. Randall, Fort. Sully, Fort. Totten, Fort. Yates, Fort. <b>DISTRICT OF COLUMBIA.</b> Washington Barracks. <b>FLORIDA.</b> Barrancas, Fort. Saint Francis Barracks.	<b>IDAHO.</b> Boise Barracks. Sherman, Fort. <b>ILLINOIS.</b> Rock Island Arsenal. Sheridan, Fort. <b>INDIAN TERRITORY.</b> Gibson, Fort. Reno, Fort. Sill, Fort. Supply, Fort. <b>KANSAS.</b> Hays, Fort. Leavenworth, Fort. Leavenworth Prison. Riley, Fort. <b>KENTUCKY.</b> Newport Barracks. <b>LOUISIANA.</b> Jackson Barracks. <b>MAINE.</b> Kennebec Arsenal. Preble, Fort.	<b>MARYLAND.</b> McHenry, Fort. <b>MASSACHUSETTS.</b> Springfield Armory. Warren, Fort. <b>MICHIGAN.</b> Brady, Fort. Mackinac, Fort. Wayne, Fort. <b>MINNESOTA.</b> Snelling, Fort. <b>MISSOURI.</b> Jefferson Barracks. <b>MONTANA.</b> Astinniboine, Fort. Custer, Fort. Keogh, Fort. Maginnis, Fort. Missoula, Fort. Poplar River, Fort. Shaw, Fort. <b>NEBRASKA.</b> Niobrara, Fort.	<b>NEBRASKA—Cont'd.</b> Omaha, Fort. Robinson, Fort. Sidney, Fort. <b>NEW MEXICO.</b> Bayard, Fort. Marcy, Fort. Selden, Fort. Stanton, Fort. Union, Fort. Wingate, Fort. <b>NEW YORK.</b> Columbus, Fort. David's Island. Hamilton, Fort. Madison Barracks. Niagara, Fort. Plattsburgh Barracks. Porter, Fort. Schuyler, Fort. Wadsworth, Fort. Watervliet Arsenal. West Point Mil. Acad'my.	<b>NEW YORK—Cont'd.</b> Willett's Point. <b>OHIO.</b> Columbus Barracks. <b>OREGON.</b> Klamath, Fort. <b>PENNSYLVANIA.</b> Allegheny Arsenal. Frankford Arsenal. <b>RHODE ISLAND.</b> Adams, Fort. <b>TEXAS.</b> Bliss, Fort. Brown, Fort. Clark, Fort. Davis, Fort. Eagle Pass, Camp. Elliott, Fort. Hancock, Fort. McIntosh, Fort. Peña Colorado, Camp.	<b>TEXAS—Cont'd.</b> Ringgold, Fort. San Antonio, Post at. <b>UTAH.</b> Du Chesne, Fort. Douglas, Fort. <b>VIRGINIA.</b> Monroe, Fort. Myer, Fort. <b>WASHINGTON TER.</b> Canby, Fort. Spokane, Fort. Townsend, Fort. Vancouver, Fort. Walla Walla, Fort. <b>WYOMING.</b> Bridger, Fort. D. A. Russell, Fort. Laramie, Fort. McKinney, Fort. Pilot Butte, Camp. Sheridan, Camp. Washakie, Fort.
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